Operation Manual

IPE200 Engineering Drive Inverter

SHENZHEN INVT ELECTRIC CO., LTD.

Content

Safety precautions

Please read this operational manual carefully before installation, operation, maintenance or inspection.

In this manual, the safety precautions were sorted to “WARNING” or “CAUTION”.


WARNING Points out potential danger which, if not avoided, may cause physical injury or death.


CAUTION Points out potential danger which, if not avoided, may result in mild or moderate physical injury and damage to the equipment. It’s also available to warns about unsafe operations.

In some cases, even the content described in “Note” may also cause serious accidents. So please follow these important precautions in any situations.

★ **NOTE** is the necessary step to ensure the proper operation.

Warning signs are presented on the front cover of inverters.
Please follow these instructions when using the inverter.

WARNING
● **May cause injury or electric shock.** ● **Please follow the instructions in the manual before installation or operation.** ● **Disconnect all power line before opening front cover of unit. Wait at least 5 minutes until DC Bus capacitors discharge.** ● **Use proper grounding techniques.** ● **Never connect AC power to output UVW terminals**

1. Introduction

1.1 Technology Features

- **Input & Output**
  - Input Voltage Range: 380V±15% (400V) or 660V±15%(690V)
  - Input Frequency Range: 47~63Hz
  - Output Voltage Range: 0~rated input voltage
  - Output Frequency Range: 0~400Hz
- **I/O Features**
  - Programmable Digital Input: Standard 6 inputs, of which 1 input can support high speed pulse input and the I/O card can extend 4 inputs
  - Programmable Analog Input: AI1 can accept input of 0V ~10V, AI2 can accept input of 0~10V or 0~20mA
  - Programmable Open Collector Output: Standard 2 outputs (open collector output or high speed pulse output and the extension card can extend 1 output)
  - Relay Output: Provide 2 output terminals and the extension card can extend 1 way output
  - Analog Output: 1 output, the extension card can extend 1 output (0~20mA or 0~10V)
  - Motor temperature detection: I/O card can extend 1 temperature terminal, support PT100/PT1000 resistors
- **Main Control Function**
  - Control Mode: Sensorless vector control (SVC), Vector control with PG (VC), V/F control.
  - Overload Capacity: 60s with 150% of the rated current, 10s with 180% of the rated current and 1s with 200% of rated current
  - Starting Torque: 150% of the rated torque at 0.5Hz (SVC); 200% of the rated torque at 0Hz (VC).
  - Speed Adjusting Range: 1:100 (SVC); 1:1000 (VC).
  - Speed Accuracy: ± 0.5% of the maximum speed (SVC); ± 0.1% of the maximum speed (VC).
  - Carrier Frequency: 1.0 kHz~16.0 kHz.
  - Frequency reference source: Digital setting, analog setting, high-speed pulse, multi-step speed terminal reference, UP/DOWN terminal reference, Modbus remote communication setting, profibus communications setting and frequency switching.
  - Running Mode: Keypad command, terminals command, Modbus communication

command, PROFIBUS communication command

- Starting and stopping DC braking
- PG Card: asynchronous PG Card (12~15V or 24V), synchronous PG Card (5V)
- Automatic Voltage Regulation (AVR): Keep the output voltage stable automatically when input voltage transients
- More than 30 kinds of fault protections function: Protection from overcurrent, overvoltage, undervoltage, overtemperature, phase loss, overload and so on.
- "Black box" function: 17 kinds of waveform information within 0.2 secons are saved automatically before last running fault, which facilitates analysis of fault cause.

1.2 Model instruction

IPE200 - 1 0 – 037 – 4

① ②③ ④ ⑤

Figure 1-1 Model instruction of the inverter

Key	Serial No.	Instruction	Example
Product type	①	Product type	IPE200- Engineering drive inverter
Product name	②	Multidrive rectification / topological type	1: Two-quadrant variable frequency drive
			2: Four-quadrant variable frequency drive
			5: Invertering
			…
	③	Structure	1: Modules
			2: Standard drive products
			6: Cabinet products (IP20)
			…
Rated power	④	Rated power	Example: 037:37kW
Voltage degree	⑤	Voltage degree	4: 400V(380-415)
			6: 690V(525-690)

1.3 IPE200-11 Engineering drive invertering module

Model	Voltage	Standard application	Heavy-load application

		Output power	Input current	Output current	Output power	Input current	Output current
		P_{cont} (KW)	I_e (A)	I_{cont} (A)	P_{hd} (kW)	I_{eh} (A)	I_{hd} (A)
IPE200-11-200-4	400V	220	430	425	200	385	380
IPE200-11-250-4		280	545	530	250	485	480
IPE200-11-315-4		350	625	650	315	610	600
IPE200-11-400-4		450	810	831	400	715	720
IPE200-11-250-6	690V	280	305	300	250	255	270
IPE200-11-315-6		350	380	380	315	334	334
IPE200-11-400-6		450	475	480	400	411	430
IPE200-11-500-6		500	518	540	450	475	493

1.4 IPE200-12 Engineering drive inverter

Model	Voltage degree	Standard application			Heavy-load application		
		Output power	Input current	Output current	Output power	Input current	Output current
		P_{cont} (KW)	I_e (A)	I_{cont} (A)	P_{hd} (kW)	I_{eh} (A)	I_{hd} (A)
IPE200-12-004-4	400V	5.5	15	13	3.7	10	9
IPE200-12-5R5-4		7.5	20	17	5.5	15	13
IPE200-12-7R5-4		11	26	25	7.5	20	17
IPE200-12-011-4		15	35	32	11	26	25
IPE200-12-015-4		18.5	38	37	15	35	32
IPE200-12-018-4		22	46	45	18.5	38	37
IPE200-12-022-4		30	62	60	22	46	45
IPE200-12-030-4		37	76	75	30	62	60
IPE200-12-037-4		45	90	90	37	76	75
IPE200-12-045-4		55	105	110	45	90	90
IPE200-12-055-4		75	140	150	55	105	110
IPE200-12-075-4		90	160	176	75	140	150
IPE200-12-090-4		110	210	210	90	160	176
IPE200-12-110-4		132	240	250	110	210	210
IPE200-12-132-4		160	290	300	132	240	250

Model	Voltage degree	Standard application			Heavy-load application		
		Output power	Input current	Output current	Output power	Input current	Output current
		P_{cont} (KW)	I_e (A)	I_{cont} (A)	P_{hd} (kW)	I_{eh} (A)	I_{hd} (A)
IPE200-12-160-4		185	330	340	160	290	300
IPE200-12-185-4		200	370	380	185	330	340
IPE200-12-200-4		220	410	415	200	370	380
IPE200-12-220-4		250	460	470	220	410	415
IPE200-12-250-4		280	500	520	250	460	470
IPE200-12-280-4		315	580	600	280	500	520
IPE200-12-315-4		350	620	640	315	580	600
IPE200-12-350-4					350	620	640
IPE200-12-400-4					400	670	690
IPE200-12-500-4					500	835	860
IPE200-12-018-6	690V	22	38	28	18.5	28	22
IPE200-12-022-6		30	40	35	22	38	28
IPE200-12-030-6		37	47	45	30	40	35
IPE200-12-037-6		45	55	52	37	47	45
IPE200-12-045-6		55	65	63	45	55	52
IPE200-12-055-6		75	85	86	55	65	63
IPE200-12-075-6		90	95	98	75	85	86
IPE200-12-090-6		110	118	121	90	95	98
IPE200-12-110-6		132	145	150	110	118	121
IPE200-12-132-6		160	165	175	132	145	150
IPE200-12-160-6		185	190	198	160	165	175
IPE200-12-185-6		200	210	218	185	190	198
IPE200-12-200-6		220	230	240	200	210	218
IPE200-12-220-6		250	255	270	220	230	240
IPE200-12-250-6		280	290	305	250	255	270
IPE200-12-280-6		315	334	350	280	290	305
IPE200-12-315-6		350	360	380	315	334	350
IPE200-12-350-6					350	360	380
IPE200-12-400-6					400	411	430

Model	Voltage degree	Standard application			Heavy-load application		
		Output power	Input current	Output current	Output power	Input current	Output current
		P_{cont} (KW)	I_e (A)	I_{cont} (A)	P_{hd} (kW)	I_{eh} (A)	I_{hd} (A)
IPE200-12-500-6					500	518	540
IPE200-12-560-6					560	578	600
IPE200-12-630-6					630	655	680

1.5 IPE200-22 Engineering drive four-quadrant inverter

Model	Voltage degree	Standard application			Heavy-load application		
		Output power	Input current	Output current	Output power	Input current	Output current
		P_{cont} (KW)	I_e (A)	I_{cont} (A)	P_{hd} (kW)	I_{eh} (A)	I_{hd} (A)
IPE200-22-075-4	400V	90	140	180	75	115	150
IPE200-22-090-4		110	170	215	90	140	180
IPE200-22-110-4		132	200	260	110	170	215
IPE200-22-132-4		160	245	305	132	200	260
IPE200-22-160-4		185	280	350	160	245	305
IPE200-22-200-4		220	335	425	200	300	380

1.6 IPE200-51 Engineering drive invertering module

Model	Voltage degree	Standard application		Heavy-load application	
		Output power	Output current	Output power	Output current
		P_{cont} (KW)	I_{cont} (A)	P_{hd} (kW)	I_{hd} (A)
IPE200-51-200-4	400V	220	425	200	380
IPE200-51-250-4		280	530	250	480
IPE200-51-315-4		350	650	315	600
IPE200-51-400-4		450	831	400	720
IPE200-51-250-6	690V	280	300	250	270
IPE200-51-315-6		350	380	315	334

Model	Voltage degree	Standard application		Heavy-load application	
		Output power	Output current	Output power	Output current
		P_{cont} (KW)	I_{cont} (A)	P_{hd} (kW)	I_{hd} (A)
IPE200-51-400-6		450	480	400	430
IPE200-51-500-6		500	540	450	493

1.7 IPE200-91 Engineering drive PWM rectifier

Model	Voltage degree	Standard application			Heavy-load application		
		Output power	Input current	Bus current	Output power	Input current	Bus current
		P_{cont} (KW)	I_e (A)	I_{cont} (A)	P_{hd} (kW)	I_{eh} (A)	I_{hd} (A)
IPE200-91-200-4	400V	220	335	325	200	300	295
IPE200-91-250-4		280	425	410	250	380	370
IPE200-91-315-4		350	530	515	315	480	460
IPE200-91-400-4		450	685	660	400	610	590
IPE200-91-250-6	690V	280	250	270	250	220	240
IPE200-91-315-6		350	310	330	315	280	300
IPE200-91-400-6		450	400	430	400	350	380
IPE200-91-500-6		500	440	480	450	400	430

2. Unpacking inspection

 **CAUTION**
●**Don't install or use any inverter that is damaged or has fault parts, otherwise physical injury may occur.**

Check the following items after unpacking the inverter.

1. Inspect the entire exterior of the inverter to ensure there are no scratches or other damage caused by the transportation.
2. Ensure there is operation manual in the packing box.
3. Inspect the nameplate and ensure it is what you ordered.
4. Ensure the optional parts are what you need if you have ordered ones.

Please contact the local agent if there is any damage to the inverter or optional parts.

3. Disassemble and installation

WARNING

●Only qualified people are allowed to operate on the drive device/system. Ignoring the instructions in “warning” may cause serious physical injury or death or property loss.

●Connect the input power lines tightly and permanently. And ground the device with proper techniques.

●Even when the inverter is stopped, dangerous voltage is present at the terminals:

- Power Terminals: R, S, T
- Motor Connection Terminals: U, V, W.

●Stop the drive and disconnect it from the power line. Wait for at least 10 minutes to let the drive discharge and then begin the installation.

●Minimum cross-sectional areas of the grounding conductor should be at least 10m². Or you can select the larger one between the cross-sectional area of the power cord conductors and the cross-sectional area of the grounding conductor according to the following table:

the cross-sectional areas of power cord conductors m²	the cross-sectional areas of grounding conductors
S≤16	S
16<S≤35	16
35<S	S/2

CAUTION

●Life the inverter by its base other than the keypad or the cover. The dropping of the main part may cause physical injury.

●The inverter is fixed on a non-flammable wall such as metal and away from heat and flammable materials to avoid the fire.

●If more than two drives are installed in a cabinet; the temperature should be lower than 40℃ by means of a cooling fan. Overheat may cause fire or damage to the device.

3.1 Environmental Requirement

3.1.1 Temperature and Humidity

The ambient temperature is among -10 °C to 40 °C and the inverter has to derate by 4% for every additional 1 °C if the ambient temperature exceeds 40 °C. The temperature cap is 50 °C. Relative humidity of the air: ≦90%. No condensation is allowed.

3.1.2 Altitude

The inverter can run at the rated power if the installation site is less than 1000m (including 1000m) above the sea level. But it has to derate if the altitude exceeds 1000m. See the following figure for detailes:

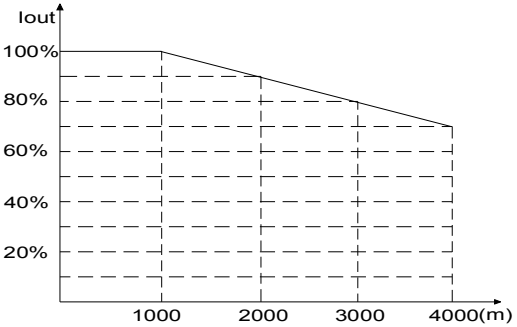


Figure 3-1 Relationship between output current and altitude

3.1.3 Other environment requirements

- The inverter can not bear fierce impact or shock. So the oscillation range should be less than 5.88m/s^2(0.6g).
- The inverter should keep away from the electromagnetic radiation source.
- The inverter should keep away from water and condensation.
- The inverter should keep away from contaminative air, such as corrosive gas, oil mist and conductive dust.
- The inverter should keep away from direct sunlight, oil mist, and steam and vibration environment.

4. Wiring and Commissioning

4.1 Connections of Peripheral Devices

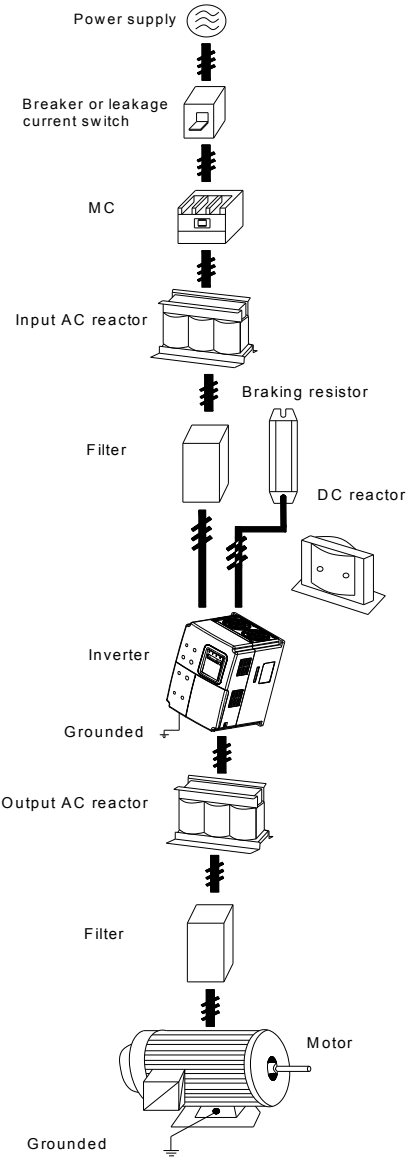


Figure 4-1 Connections of peripheral devices

4.2 Terminal Configuration

4.2.1 Main Circuit Terminals of the common inverter

Terminal	Description
R, S, T	Terminals of 3 phase AC input
(+), (-)	Spare terminals of external braking unit
P1, (+)	Spare terminals of external DC reactor
U, V, W	Terminals of 3 phase AC output
⏚	Terminal of ground

4.2.2 Main Circuit Terminals of the module inverter

Terminal	Description
R, S, T	Terminals of 3 phase AC input
(+), (-)	Positive and negative DC bus terminals
U, V, W	Terminals of 3 phase AC output
⏚	Terminal of ground

4.2.3 Control Circuit Terminals

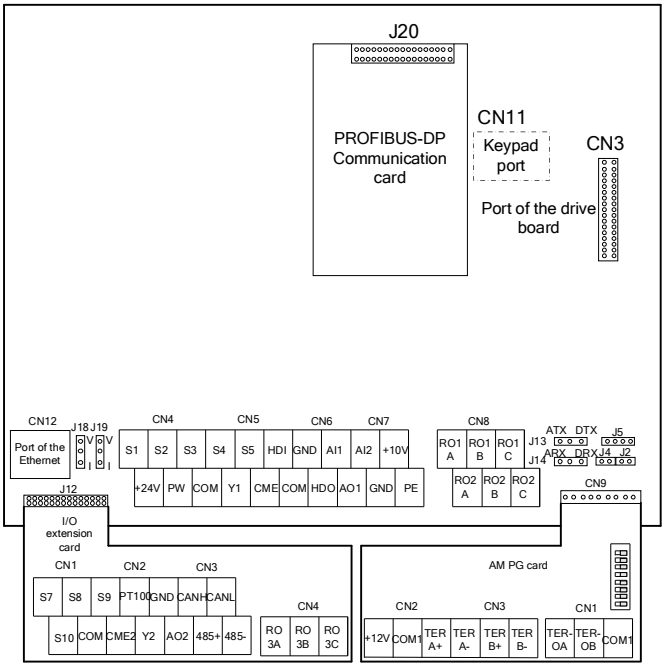


Figure 4-2 Interface distributions in the control board

Note: The inverter only supports one keypad whose interface is on the back of the control board, and CN12 is for the Ethernet port.

4.3 Typical Wiring Diagram

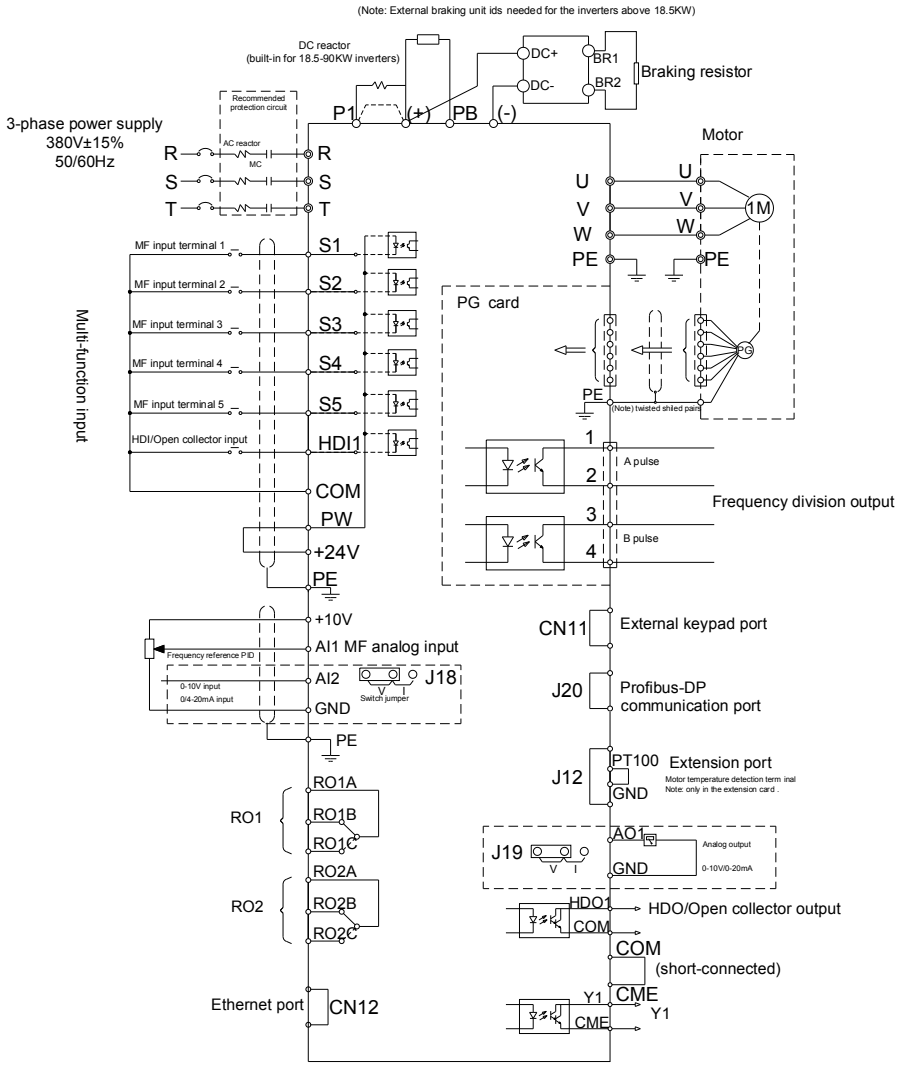


Figure 4-3 Wiring diagram

4.4 Wiring the Main Circuits

4.4.1 Wiring at the side of power supply

- Circuit breaker

It is necessary to connect a circuit breaker which is compatible with the capacity of inverter between 3ph AC power supply and power input terminals (R, S, T). The capacity of breaker is 1.5~2 times to the rated current of the inverter.

- Electromagnetic Contactor

In order to cut off the input power effectively when fault occurs to the system, contactor should be installed at the input side to control the ON-OFF of the main circuit power supply.

- AC reactor

In order to prevent the rectifier damage result from the large current, AC reactor should be installed at the input side. It can also prevent rectifier from sudden variation of power voltage or harmonic generated by phase-control load.

- Input EMC filter

The surrounding device may be disturbed by the cables when the inverter is working. EMC filter can minimize the interference. The detailed wiring is as below:

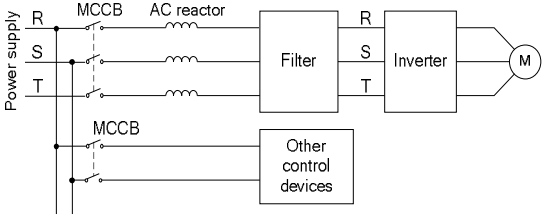


Figure4-4 Wiring at input side

4.4.2 Wiring for inverter

- DC reactor

CHV inverters (18.5~90kW) are equipped with internal DC reactors for the improvement of power factors and the avoidance of damage from high input current to the rectifying components because of the high-capacity transformer. The device can also cease the damage to the rectifying components which are caused by supply net voltage transients and harmonic waves of the loads.

- Braking unit and braking resistor

1. Inverters of 15kW and below have built-in braking unit. In order to dissipate the regenerative energy generated by dynamic braking, the braking resistor should be installed at (+) and PB terminals. The wire length of braking resistor should be less than 5m.

2. Inverters of 18.5kW and above need connect external braking unit which should be installed at (+) and (-) terminals. The cable between inverter and braking unit should be less than 5m. The cable between braking unit and braking resistor should be less than 10m.
3. The temperature of the braking resistor will increase because of the released energy. Safety protection and good ventilation is recommended during the installation. If the braking unit is needed, (+) and (-) terminal of the braking correspond to the (+) and (-) terminal of the inverter and the braking resistor is connected to the terminal of BR1 and BR2.

Note: Be sure that the electric polarity of (+) (-) terminals is right; it is not allowed to connect (+) with (-) terminals directly, Otherwise damage or fire could occur.

4.4.3 Wiring at motor side of main circuit

- Output reactor

If the distance between the inverter and the motor is longer than 50m, frequent overcurrent protection may occur to the inverter because of high leakage current caused by parasitic capacitance effects from the long cables to the ground. In order to avoid the damage of the motor insulation, it is necessary to add reactor compensation.

- Output EMC filter

EMC filte can minimize the radio noise cause by the cables between the inverter and the motor and the leakage current of the conducting wires, which is illustrated as below:

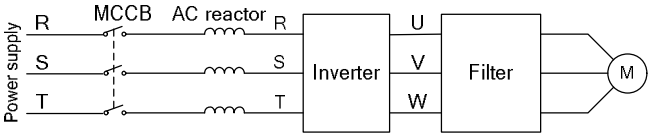


Figure 4-5 Wiring at motor side

4.4.4 Wiring of regenerative unit

Regenerative unit is used for putting the electricity generated by braking of motor to the grid. Compared with traditional 3 phase inverse parallel bridge type rectifier unit, regenerative unit uses IGBT so that the total harmonic distortion (THD) is less than 4%. Regenerative unit is widely used for centrifugal and hoisting equipment. Please refer to ***The Manual of Regenerative Units of RBU Series*** for details.

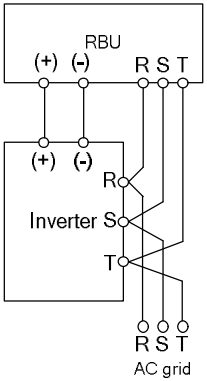


Figure 4-6 Wiring of regenerative unit

4.4.5 Ground Wiring (PE)

Ground the PE terminal of the inverter with grounding resistors (less than 10Ω) for the insurance of safety and avoidance of electrical shock and fire. It is apporiate to use thick and short multiple copper core wires whose sectional area is larger than $3.5mm^2$. It is not recommended to use the public earth wire; otherwise, the grounding wires may complete the circuit.

4.5 Wiring Control Circuit Terminals

4.5.1 Precautions

- Use shielded or twisted-pair cables to connect control terminals.
- Connect the ground terminal (PE) with shield wire.
- The cable connected to the control terminal should leave away from the main circuit and heavy current circuits (including power supply cable, motor cable, relay and contactor connecting cable) at least 20cm and parallel wiring should be avoided. It is suggested to apply perpendicular wiring to prevent inverter malfunction caused by external interference.

4.5.2 Control circuit terminals

Terminal	Description
S1~S5	ON-OFF signal input, optical coupling isolation input terminal with PW and COM. Input voltage range: 9~30V Input impedance: 3.3kΩ
HDI1(HDI2)	High speed pulse or ON-OFF signal input, and the detailed method

Terminal	Description
	is determined by P5.00, optical coupling with PW and COM. Pulse input frequency range: 0~50kHz Input voltage range: 9~30V Input impedance: 1.1kΩ
PW	External power supply. +24V terminal is connected to PW terminal as default setting. If the user need external power supply, disconnect +24V terminal with PW terminal and connect PW terminal with external power supply.
+24V	Local power supply of +24V. Maximum output current: 150mA
AI1	Analog input, 0~10V Input impedance: 10kΩ
AI2	Analog input, 0~10V/ 0~20mA, switched by J18. Input impedance:10kΩ (voltage input) / 250Ω (current input)
GND	Reference zero potential of +10V. GND must isolated from COM.
Y1(Y2)	Open collector output terminal, the corresponding common terminal is CME. External voltage range: 0~24V Output current range: 0~50mA The range of 24V pull-up resistor: 2k~10kΩ
CME	Common terminal of open collector output
COM	Common terminal for digital signal and +24V (or external power supply).
+10V	Supply +10V for inverter.
HDO	High speed pulse output terminal. The corresponding common terminal is COM. Output frequency range: 0~50 kHz
AO1(AO2)	Provide voltage or current output which can be switched by J19. Output range: 0~10V/ 0~20mA
PE	Ground Terminal.
RO1A, RO1B and RO1C	RO1 relay output: RO1A—common; RO1B—NC; RO1C—NO. Contact capacity: AC 250V/3A, DC 30V/1A.
RO2A, RO2B	RO2 relay output: RO2A—common; RO2B—NC; RO2C—NO.

Terminal	Description
and RO2C	Contact capacity: AC 250V/3A, DC 30V/1A.
RO3A, RO3B and RO3C	RO3 relay output: RO3A—common; RO3B—NC; RO3C—NO. Contact capacity: AC 250V/3A, DC 30V/1A.

4.5.3 Jumper on control board

Jumper	Description
J2, J4, J5, J13, J14	It is prohibited to be connected together, otherwise it will cause inverter malfunction.
J18	Switch between (0~10V) voltage input and (0~20mA) current input. V connect to GND means voltage input; I connected with GND means current input.
J19	Switch between (0~10V) voltage output and (0~20mA) current output. V connected with OUT means voltage output; I connected with OUT means current output.

4.6 Installation Guidline to EMC Compliance

4.6.1 General knowledge of EMC

EMC is the abbreviation of electromagnetic compatibility, which means the device or system has the ability to work normally in the electromagnetic environment and will not generate any electromagnetic interference to other equipments.

EMC includes two subjects: electromagnetic interference and electromagnetic anti-jamming.

According to the transmission mode, Electromagnetic interference can be divided into two categories: conducted interference and radiated interference.

Conducted interference is the interference transmitted by conductor. Therefore, any conductors (such as wire, transmission line, inductor, capacitor and so on) are the transmission channels of the interference.

Radiated interference is the interference transmitted in electromagnetic wave, and the energy is inverse proportional to the square of distance.

Three necessary conditions or essentials of electromagnetic interference are: interference source, transmission channel and sensitive receiver. For customers, the solution of EMC problem is mainly in transmission channel because of the device attribute of disturbance source and receiver can not be changed.

4.6.2 EMC features of inverter

Like other electric or electronic devices, inverter is not only an electromagnetic interference source but also an electromagnetic receiver. The operating principle of inverter determines that it can produce certain electromagnetic interference noise. And the same time inverter should be designed with certain anti-jamming ability to ensure the smooth working in certain electromagnetic environment. The following is its EMC features:

- Input current is non-sine wave. The input current includes large amount of high-harmonic waves that can cause electromagnetic interference, decrease the grid power factor and increase the line loss.
- Output voltage is high frequency PMW wave, which can increase the temperature rise and shorten the life of motor. And the leakage current will also increase, which can lead to the leakage protection device malfunction and generate strong electromagnetic interference to influence the reliability of other electric devices.
- As the electromagnetic receiver, too strong interference will damage the inverter and influence the normal using of customers.
- In the system, EMS and EMI of inverter coexist. Decrease the EMI of inverter can increase its EMS ability.

4.6.3 EMC Installation Guideline

In order to ensure all electric devices in the same system to work smoothly, this section, based on EMC features of inverter, introduces EMC installation process in several aspects of application (noise control, site wiring, grounding, leakage current and power supply filter). The good effective of EMC will depend on the good effective of all of these five aspects.

4.6.3.1 Noise control

All the connections to the control terminals must use shielded wire. And the shield layer of the wire must ground near the wire entrance of inverter. The ground mode is 360 degree annular connection formed by cable clips. It is strictly prohibitive to connect the twisted shielding layer to the ground of inverter, which greatly decreases or loses the shielding effect.

Connect inverter and motor with the shielded wire or the separated cable tray. One side of shield layer of shielded wire or metal cover of separated cable tray should connect to ground, and the other side should connect to the motor cover. Installing an EMC filter can reduce the electromagnetic noise greatly.

4.6.3.2 Site wiring

Power supply wiring: the power should be separated supplied from electrical transformer. Normally it is 5 core wires, three of which are fire wires, one of which is the neutral wire, and one of which is the ground wire. It is strictly prohibitive to use the same line to be both the

neutral wire and the ground wire

Device categorization: there are different electric devices contained in one control cabinet, such as inverter, filter, PLC and instrument etc, which have different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize these devices into strong noise device and noise sensitive device. The same kinds of device should be placed in the same area, and the distance between devices of different category should be more than 20cm.

Wire Arrangement inside the control cabinet: there are signal wire (light current) and power cable (strong current) in one cabinet. For the inverter, the power cables are categorized into input cable and output cable. Signal wires can be easily disturbed by power cables to make the equipment malfunction. Therefore when wiring, signal cables and power cables should be arranged in different area. It is strictly prohibitive to arrange them in parallel or interlacement at a close distance (less than 20cm) or tie them together. If the signal wires have to cross the power cables, they should be arranged in 90 angles. Power input and output cables should not either be arranged in interlacement or tied together, especially when installed the EMC filter. Otherwise the distributed capacitances of its input and output power cable can be coupling each other to make the EMC filter out of function.

4.6.3.3 Grounding

Inverter must be ground safely when in operation. Grounding enjoys priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also is the simplest, most effective and lowest cost solution for EMC problems.

Grounding has three categories: special pole grounding, common pole grounding and series-wound grounding. Different control system should use special pole grounding, and different devices in the same control system should use common pole grounding, and different devices connected by same power cable should use series-wound grounding.

4.6.3.2 Leakage Current

Leakage current includes line-to-line leakage current and over-ground leakage current. Its value depends on distributed capacitances and carrier frequency of inverter. The over-ground leakage current, which is the current passing through the common ground wire, can not only flow into inverter system but also other devices. It also can make leakage current circuit breaker, relay or other devices malfunction. The value of line-to-line leakage current, which means the leakage current passing through distributed capacitors of input output wire, depends on the carrier frequency of inverter, the length and section areas of motor cables. The higher carrier frequency of inverter, the longer of the motor cable and/or the bigger cable section area, the larger leakage current will occur.

Countermeasure:

Decreasing the carrier frequency can effectively decrease the leakage current. In the case of motor cable is relatively long (longer than 50m), it is necessary to install AC reactor or sinusoidal wave filter at the output side, and when it is even longer, it is necessary to install one reactor at every certain distance.

4.6.3.5 EMC Filter

EMC filter has a great effect of electromagnetic decoupling, so it is preferred for customer to install it.

For inverter, noise filter has following categories:

- Noise filter installed at the input side of inverter;
- Install noise isolation for other equipment by means of isolation transformer or power filter.

4.6.4 If the user installs the inverter and EMI filter according to the installation guideline, it should comply with:

- EN61000-6-4
- EN61000-6-3
- EN61800-3 and EN61000-6-4

5. Operation

5.1 Operating Keypad Description

5.1.1 Keypad schematic diagram

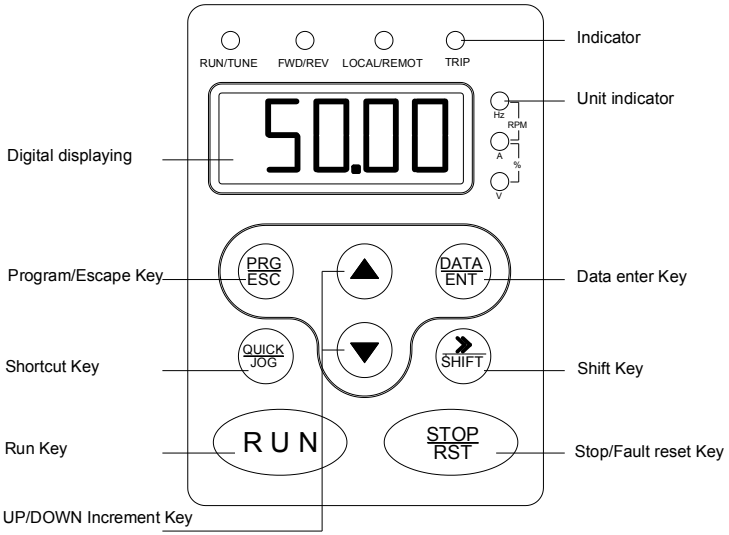


Figure 5-1 Keypad schematic diagram

5.1.2 Button function description

Button	Name	Description
PRG ESC	Program/Escape Key	Entry or escape from first-class menu. Delete shortcut parameters
DATA ENT	Data enter Key	Progressively enter menu and confirm parameters.
▲	UP Increment Key	Progressively increase data or function codes.
▼	DOWN Decrement Key	Progressive decrease data or function codes.
SHIFT	Shift Key	In parameter setting mode, press this button to select the bit to be modified. In other modes, cyclically displays parameters by right shift
RUN	Run Key	Start to run the inverter in keypad control mode.
STOP RST	Stop/Fault reset	In running state, restricted by P7.04, can be used to

Button	Name	Description
	Key	stop the inverter. When fault alarms, can be used to reset the inverter out of the restriction of P7.04
QUICK JOG	Shortcut Key	Determined by Function Code P7.03: 0: Jogging (only for keypad control) 1:Switch between forward and reverse rotation(only for keypad control)
RUN + STOP RST	Combination Key	Pressing the RUN and STOP/RST at the same time can achieve inverter coast to stop.

5.1.3 Indicator light description

5.1.3.1 Function Indicator Light Description

Function indicator	Description
RUN/TUNE	Extinguished: stop state Flickering: parameter autotuning state Light on: operating state
FWD/REV	Extinguished: forward operation Light on: reverse operation.
LOCAL/REMOT	Extinguished: keypad control Flickering: terminal control Light on: communication control
TRIP	Extinguished: normal operation state Flickering: overload pre-warning state

5.1.3.2 Unit Indicator Light Description

Unit indicator	Description
Hz	Frequency unit
A	Current unit
V	Voltage unit
RPM	Rotating speed unit
%	Percentage

5.1.3.3 Digital Display

5 digit LED , which can display all kinds of monitoring data and alarm codes such as reference frequency, output frequency and so on.

5.2 Operation Process

5.2.1 Parameter setting

Three levels of menu are:

- Function code group (first-level);
- Function code (second-level);
- Function code value (third-level).

Remarks:

Pressing both the PRG/ESC and the DATA/ENT can return to the second-class menu from the third-class menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-class menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-class menu without saving the parameters, and keep staying at the current function code.

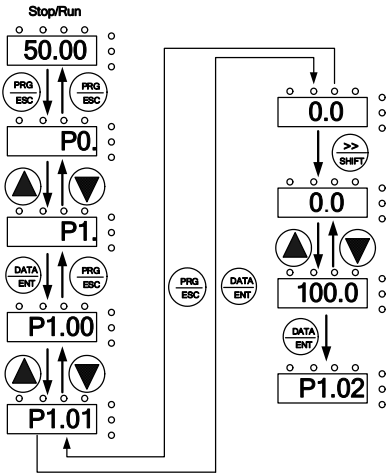


Figure 5-2 Flow chart of parameter setting.

Under the third-class menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

- This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;
- This function code is not modifiable in running state, but modifiable in stop state.

5.2.2 Fault reset

If the inverter has fault, it will prompt the related fault information. User can use STOP/RST or according terminals determined by P5 Group to reset the fault. After fault reset, the inverter is at

stand-by state. If user does not reset the inverter when it is at fault state, the inverter will be at operation protection state, and can not run.

5.2.3 Parameters copy

Please refer to the function instruction of the external keypad for LCD.

5.2.4 Motor parameter autotune

If “Sensorless Vector Control” or “Vector Control with PG” mode is chosen, motor nameplate parameters must be input correctly as the autotuning is based on it. The performance of vector control depends on the parameters of motor strongly, so to achieve excellent performance, firstly must obtain the parameter of motor exactly.

The procedure of motor parameter autotuning is as follows:

Firstly, choose keypad command as the run command source (P0.01).

And then input following parameters according to the actual motor parameters:

P2.01: motor rated frequency;

P2.02: motor rated speed;

P2.03: motor rated voltage;

P2.04: motor rated current;

P2.05: motor rated power.

Note: the motor should be de-coupled from its load; otherwise, the motor parameters obtained by autotuning may be not correct.

Set P0.17 to be 1, and for the detail process of motor parameter autotuning, please refer to the description of Function Code P0.17. And then press RUN on the keypad panel, the inverter will automatically calculate following parameter of the motor:

P2.06: motor stator resistance;

P2.07: motor rotor resistance;

P2.08: motor stator and rotor inductance;

P2.09: motor stator and rotor mutual inductance;

P2.10: motor current without load;

During the autotune, the keypad will display TUN-1 and TUN-2. If the keypad displays -END-, then motor autotuning is finished.

5.2.5 Password setting

CHV series inverters offer user’s password protection function. When P7.00 is set to be non-zero, it will be the user’s password, and after exiting function code edit mode, it will become effective instantly. Press the PRG/ESC again to access the function code edit mode, “-----”will be displayed, and the operator must input correct user’s password, otherwise will be unable to access it.

If it is necessary to cancel the password protection function, just set P7.00 to be zero.

Note: The password has no function to parameters in shortcut menu.

5.3 Running State

5.3.1 Power-on initialization

Firstly the system initializes during the inverter power-on, and LED displays “8.8.8.8.8”. After the initialization is completed, the inverter is on stand-by state.

5.3.2 Stand-by

In stop or running state, parameters of multi-state can be displayed. Whether or not to display this parameter can be chosen through Function Code P7.06 (Running state display selection) and P7.07 (Stopping parameters) according to binary bits. Please refer to the description of P7.06 and P7.07 for detailed information. .

In stop state, there are 16 parameters which can be chosen to display or not. They are: reference frequency, DC bus voltage, Input-Output terminal state, open collector output state, PID setting, PID feedback, AI1 voltage, AI2 voltage, AI3 voltage/current, AI4 voltage, HDI1 frequency, HDI2 frequency, step number of simple PLC or multi-step speed, length value. Whether or not to display can be determined by setting the corresponding binary bit of P7.07. Press 》/SHIFT to scroll through the parameters in right order .

5.3.3 Operation

In running state, there are 21 running parameters. They are: running frequency, reference frequency, DC bus voltage, output voltage, output current, rotating speed, output power, output torque, PID setting, PID feedback, ON-OFF input state, open collector output state, length value, count value, step number of PLC or multi-step speed, AI1 voltage, AI2 voltage, AI3 voltage/current, AI4 voltage, HDI1 frequency, HDI2 frequency. Whether or not to display can be determined by setting the corresponding binary bit of P7.06. Press the 》/SHIFT to scroll through the parameters in right order .

5.3.4 Fault

In fault state, the inverter will display parameters of STOP state besides parameters of fault state. Press 》/SHIFT to scroll through the parameters in right order .

6. Detailed function description

6.1 P0 Group--Basic Function

Function Code	Name	Description	Setting Range	Factory Setting
P0.00	Speed control mode	0:Sensorless vector control 1:Vector control with PG 2:V/F control	0~2	0

0: Sensorless vector control: It is widely used in the application which requires high torque at low speed, higher speed accuracy, and quicker dynamic response, such as machine tool, injection molding machine, centrifugal machine and wire-drawing machine, etc.

1: Vector control with PG: Close-loop vector control can achieve high precision speed control and torque control. Therefore it is suitable for the application requiring high accuracy speed and torque, such as textile, paper, lifting and elevator, etc.

If vector control with PG mode is applied, it is needed to equip with PG card and to correctly select and install the encoder.

2: V/F control: It is suitable for general purpose application such as pumps, fans etc.

Note:

- **The inverter can drive only one motor when P0.00 is set to be 0 or 1. When P0.00 is set to be 2, inverter can drive multi-motors.**
- **The autotuning of motor parameters must be accomplished properly when P0.00 is set to be 0 or 1.**
- **In order to achieve better control characteristic, the parameters of P3 group must be adjusted according to actual situation when P0.00 is set to be 0 or 1.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.01	Run command source	0:Keypad (LOCAL/REMOT extinguished) 1:Terminal (LOCAL/REMOT flickering) 2:Communication (LOCAL/REMOT lights on) 3:Profibus command (LOCAL/REMOT lights on) 4:CAN command	0~4	0

Function Code	Name	Description	Setting Range	Factory Setting
		(LOCAL/REMOT lights on)		

The control commands of inverter include: start, stop, forward run, reverse run, jog, fault reset and so on.

0: Keypad (LED extinguished);

Both RUN and STOP/RST key are used for running command control. If Multifunction key QUICK/JOG is set as FWD/REV switching function (P7.03 is set to be 1), it will be used to change the rotating orientation. **In running state, pressing RUN and STOP/RST in the same time will cause the inverter coast to stop.**

1: Terminal (LED flickering)

The operation, including forward run, reverse run, forward jog, reverse jog etc. can be controlled by multifunctional input terminals.

2: Communication (LED lights on)

The operation of inverter can be controlled by host through communication.

3: Profibus command (LOCAL/REMOT lights on)

The running command is controlled by the upper PC through Profibus communication. It is necessary to select the extension card.

4: CAN command (LOCAL/REMOT lights on)

The running command is controlled by the upper PC through CAN communication. It is necessary to select the extension card.

Function Code	Name	Description	Setting Range	Factory Setting
P0.02	Keypad and UP/DOWN setting	0: Valid, save UP/DOWN value when power off 1: Valid, do not save UP/DOWN value when power off 2: Invalid 3: Valid during running, clear when power off	0~3	0

Set the frequency through ∧ and ∨ on the keypad or the terminal of UP/DOWN. This method can combinate with other frequency setting channels, but it has the hightest priority and mainly used to control the output frequency during the inch-adjusting.

0: Valid, save UP/DOWN value when power off.

The user can adjust the reference frequency by UP/DOWN. The value of UP/DOWN can be saved when power off.

1: Valid, do not save UP/DOWN value when power off.

User can adjust the reference frequency by UP/DOWN, but the value of UP/DOWN will not be saved when power off.

2: Invalid.

The user can not adjust the reference frequency by UP/DOWN. The value of UP/DOWN will be cleared if P0.02 is set to 2.

3: Valid during running, clear when power off

User can adjust the reference frequency by UP/DOWN when inverter is running. When inverter power off, the value of UP/DOWN will be cleared.

Note:

- **UP/DOWN function can be achieved by keypad (∧ and ∨) and multifunctional terminals.**
- **Reference frequency can be adjusted by UP/DOWN.**
- **UP/DOWN has highest priority which means UP/DOWN is always active no matter which frequency command source is.**
- **When the factory setting is restored (P0.18 is set to be 1), the value of UP/DOWN will be cleared.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.03	Frequency A command source	0: Keypad 1: AI1 2. AI2 3: HDI1 4:Simple PLC 5: Multi-Step speeds 6: PID 7: Communication 8: Profibus communication 9: CAN communication	0~9	0

0: Keypad: Please refer to description of P0.10

1: AI1

2: AI3

The reference frequency is set by analog input. AI1 is 0~10V voltage input terminal, while AI3 is -10V~10V voltage input.

Note:

- **100% of AI is corresponding to maximum frequency.**

3: HDI1

The reference frequency is set by high speed pulse input.

Pulse specification: pulse voltage range 15~30V, and pulse frequency range 0.0~50.0 kHz.

Note: High speed pulse can only be input through HDI. P5.00 must be set to be 0 (HDI), and P5.35 must be set to be 0 (reference input). For detailed relationship between HDI input and frequency, please refer to description of P5.37~P5.46.

4: Simple PLC

The user can set reference frequency, hold time, running direction of each step and acceleration/deceleration time between steps. For details, please refer to description of PA group.

5: Multi-step speeds

The reference frequency is determined by PA group. The selection of steps is determined by combination of multi-step speed terminals P5 group.

Note:

- **Multi-step speed mode enjoys priority in setting reference frequency if P0.03 is not set to be 5. In this case, only step 1 to step 15 are available.**
- **If P0.03 is set to be 5, step 0 to step 15 can be realized.**
- **Jog has higher priority than Multi-step speed.**

6: PID

The reference frequency is the result of PID adjustment. For details, please refer to description of P9 group.

7: Communication

The reference frequency is set through RS485. For details, please refer to operation manual of communication card.

8: Profibus communication

The speed command is set by Profibus communication.

9: CAN communication

The speed command is set by CAN communication.

Function Code	Name	Description	Setting Range	Factory Setting

Function Code	Name	Description	Setting Range	Factory Setting
P0.04	Frequency B command source	0: Keypad 1: AI1 2. AI2 3: HDI1 4:Simple PLC 5: Multi-Step speeds 6: PID 7: Communication 8: Profibus communication 9: CAN communication	0~9	0

Frequency B command can act as the independent reference frequency source. Under the circumstances, the usage is the same with Frequency A command. For details, please refer to P0.03.

Function Code	Name	Description	Setting Range	Factory Setting
P0.05	Scale of frequency B command	0: Maximum frequency 1: Frequency A command	0~1	0

0: Maximum frequency. 100% of the frequency B corresponds to the maximum frequency

1: Frequency A command. 100% of the frequency B corresponds with the maximum frequency. If the adjustment is needed to be based on frequency A, this setting is chosen

Note: When AI2 is selected as 0~20mA, 20mA corresponds with 5V. P0.05 is only used on condition of that frequency B command is used as plus setting

Function Code	Name	Description	Setting Range	Factory Setting
P0.06	Frequency command selection	0: A 1: B 2: A+B 3: Max(A, B)	0~3	0

This parameter can be used to select the reference frequency command.

0: Only frequency command source A is active.

1: Only Frequency command source B is active.

2: Both Frequency command source A and B are active.

Reference frequency = reference frequency A + reference frequency B.

3: Either Frequency command source A or B is active (the larger one).

Reference frequency = Max (reference frequency A, reference frequency B).

Note: The frequency command source can be switched by P5 Group.

Function Code	Name	Description	Setting Range	Factory Setting
P0.07	Maximum frequency	0~400.00Hz	0~400.00	50.00Hz

Note:

- **The frequency reference should not exceed maximum frequency.**
- **Actual acceleration time and deceleration time are determined by maximum frequency. Please pay attention to it.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.08	Upper frequency limit	P0.09~P0.07	P0.09~P0.07	50.00Hz

Note:

- **Upper frequency limit should not be greater than or equal to the maximum frequency (P0.07).**
- **Output frequency should not exceed upper frequency limit.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.09	Lower frequency limit	0.00Hz~ P0.08	0.00~P0.08	0.00Hz

Note:

- **Lower frequency limit should not be greater than upper frequency limit (P0.08).**
- **If frequency reference is lower than P0.09, the action of inverter is determined by P1.14. Please refer to description of P1.14.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.10	Keypad reference frequency	0.00 Hz ~ P0.08	0.00~P0.08	50.00Hz

When P0.03 is set to be 0, this parameter is the initial value of inverter reference frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P0.11	Acceleration time 0	0.0~3600.0s	0.0~3600.0	20.0s
P0.12	Deceleration time 0	0.0~3600.0s	0.0~3600.0	20.0s

Acceleration time is the time of accelerating from 0Hz to maximum frequency (P0.07). Deceleration time is the time of decelerating from maximum frequency (P0.07) to 0Hz. Please refer to following figure.

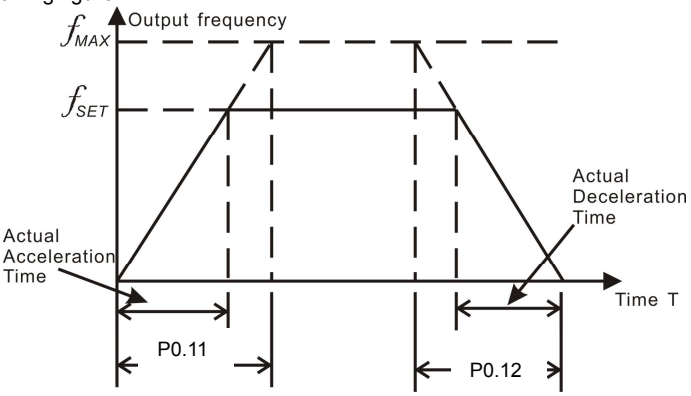


Figure 6-1 Acceleration and Deceleration time.

When the reference frequency is equal to the maximum frequency, the actual acceleration and deceleration time will be equal to the P0.11 and P0.12 respectively.

When the reference frequency is less than the maximum frequency, the actual acceleration and deceleration time will be less than the P0.11 and P0.12 respectively.

The actual acceleration (deceleration) time = P0.11 (P0.12) * reference frequency/P0.07.

CHV series inverter has 4 groups of acceleration and deceleration time.

1st group: P0.11, P0.12

2nd group: P8.00, P8.01

3rd group: P8.02, P8.03

4th group: P8.04, P8.05.

- The acceleration and deceleration time can be selected by combination of multifunctional ON-OFF input terminals determined by P5 Group.

Function Code	Name	Description	Setting Range	Factory Setting
P0.13	Running direction selection	0: Forward 1: Reverse 2: Forbid reverse	0~2	0

Note:

- **The rotation direction of motor is corresponding to the wiring of motor.**
- **When the factory setting is restored (P0.18 is set to be 1), the rotation direction of motor may be changed. Please be cautious to use.**
- **If P0.13 is set to 2, the user can not change rotation direction of motor by QUICK/JOG or terminal.**
- **After the parameter initialization, the running direction of the motor will restore into the precious state. Please use with cautions if it is fordibben to change the running direction after commissioning.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.14	Carrier frequency	0~16.0kHz	0~16.0	Depend on model

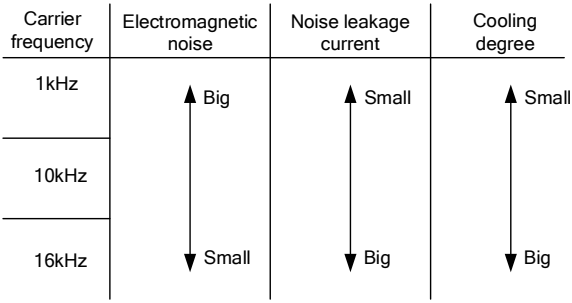


Figure 6-2 Effect of the carrier frequency.

Model	Carrier frequency
1.5~11kW	8kHz
15~55kW	4kHz
75kW~185kW	2kHz
200kW	1kHz

The advantage of high carrier frequency: ideal current waveform, little current harmonic wave

and motor noise.

The disadvantage of high carrier frequency: increasing the switch loss, increasing inverter temperature and the impact to the output capacity. The inverter needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase.

Applying low carrier frequency is contrary to the above, too low carrier frequency will cause unstable running, torque decreasing and surge.

The manufacturer has set a reasonable carrier frequency when the inverter is in factory. In general, users do not need to change the parameter.

When the frequency used exceeds the default carrier frequency, the inverter needs to derate 20% for each additional 1k carrier frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P0.15	PWM mode	0: Two-phase modulation 1: Three-phase modulation	0~1	0

Function Code	Name	Description	Setting Range	Factory Setting
P0.16	Carrier frequency adjust	0: Disabled 1: Enabled	0~1	0

0: Disabled: Carrier frequency is fixed.

1: Enabled: Carrier frequency will be adjusted based on internal temperature of the inverter. The higher the temperature, the lower the carrier frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P0.17	Motor parameters autotuning	0: No action 1: Rotation autotuning 2: Static autotuning	0~2	0

0: No action: Forbidding autotuning.

1: Rotation autotuning:

- Do not connect any load to the motor when performing autotuning and ensure the motor is in static state.
- Input the nameplate parameters of motor (P2.01~P2.05) correctly before performing autotuning. Otherwise the parameters detected by autotuning will be incorrect; it may influence the performance of inverter.
- Set the proper acceleration and deceleration time (P0.11 and P0.12) according to the

motor inertia before performing autotuning. Otherwise it may cause over-current and over-voltage fault during autotuning.

- The operation process is specified as follow:
  a. Set P0.17 to be 1 then press the DATA/ENT. At this time, LED will display "-TUN-" and flicker. Then press RUN to perform autotune. It displays TUN-0 at this time. The motor will start to run after TUN-1 displays, with the flicker of indicator light RUN/TUNE. When the autotune is done, LED displays -END-, and finally LED displays the same as stop state. When "-TUN-" is flickering, autotune can be quited by pressing PRG/ESC. During autotune, pressing STOP/RST can stop the autotune.

Note: Only keypad can control the autotuning. P0.17 will restore to 0 automatically when the autotuning is finished or cancelled.

2: Static autotuning:

- If it is difficult to disconnect the load, static autotuning is recommended.
- The operation process is the same as rotation autotuning except step c.

Note: The Mutual inductance and current without load will not be detected by static autotuning, if needed user should input suitable value according to experience.

Function Code	Name	Description	Setting Range	Factory Setting
P0.18	Restore parameters	0: No action 1: Restore factory setting 2: Clear fault records 3:Restore parameters for injection molding machine	0~3	0

0: No action

1: Inverter restores all parameters to factory setting except P2 group.

2: Inverter clear all fault records.

3: Inverter restores special parameters for injection molding machine.

This function code will restore to 0 automatically when complete the function operation.

6.2 P1 Group--Start and Stop Control

Function Code	Name	Description	Setting Range	Factory Setting
P1.00	Start Mode	0: Start directly 1: DC braking and start 2: Speed tracking and start	0~2	0

0: Start directly: Start the motor at the starting frequency determined by P1.01.

1: DC braking and start: Inverter will output DC current firstly and then start the motor at the starting frequency. Please refer to description of P1.03 and P1.04. It is suitable for the motor which have small inertia load and may reverse rotation when start.

2: Speed tracking and start: Inverter detects the rotation speed and direction of motor, then start running to its reference frequency based on current speed. This can realize smooth start of rotating motor with big inertia load when instantaneous power off.

Note: It only applies on the inverter of 5.5kW and above.

Function Code	Name	Description	Setting Range	Factory Setting
P1.01	Starting frequency	0.00~10.0Hz	0.00~10.00	1.5Hz
P1.02	Hold time of starting frequency	0.0~50.0s	0.0~50.0	0.0s

The inverter runs from the Starting frequency. After hold time of starting frequency, the inverter will accelerate to the setting frequency according to the setting acceleration time.

If the setting frequency is smaller than starting frequency, the inverter stands by. Starting frequency is not limited by lower frequency limit

Note: When sensorless vector control or V/F control is active, factory setting of P1.01 is 1.5Hz, while factory setting is 0Hz on condition of vector control.

Function Code	Name	Description	Setting Range	Factory Setting
P1.03	DC Braking current before start	0.0~150.0%	0.0~150.0	0.0%
P1.04	DC Braking time before start	0.0~50.0s	0.0~50.0	0.0s

When inverter starts, it performs DC braking according to P1.03 firstly, then start to accelerate after P1.04.

Note:

- **DC braking will take effect only when P1.00 is set to be 1.**
- **DC braking is invalid when P1.04 is set to be 0.**
- **The value of P1.03 is the percentage of rated current of inverter. The bigger the DC braking current, the greater the braking torques.**

Function Code	Name	Description	Setting Range	Factory Setting
P1.05	Acceleration /Deceleration mode	0:Linear 1:S curve	0~1	0

0: Linear: Output frequency will increase or decrease with fixed acceleration or deceleration time.

1: S curve: Output frequency will increase or decrease according to S curve. This function is widely used in applications which require smooth start and stop, such as elevators, belt conveyor etc. For details, please refer to description of P1.06 and P1.07.

Function Code	Name	Description	Setting Range	Factory Setting
P1.06	Start section of S curve	0.0~40.0% (ACC/DEC time)	0.0~40.0	30.0%
P1.07	End section of S curve	0.0~40.0% (ACC/DEC time)	0.0~40.0	30.0%

P1.06 and P1.07 are only active when P1.05=1. During t1 period, the change rate of output frequency increases from 0; During t2 period, the change rate of output frequency decrease to 0; During the period between t1 and t2, the change rate of output frequency remain constant. The curvature of S curve is codetermined by ACC/DEC time, start section time and end section time.

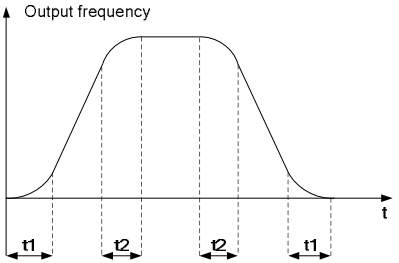


Figure 6-3 S curve diagrams.

Function Code	Name	Description	Setting Range	Factory Setting
P1.08	Stop Mode	0:Decelerate to stop 1:Coast to stop	0~1	0

0: Deceleration to stop

When the stop command takes effect, the inverter decreases the output frequency according to

P1.05 and the selected acceleration/deceleration time till stop.

1: Coast to stop

When the stop command takes effect, the inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.

Function Code	Name	Description	Setting Range	Factory Setting
P1.09	Starting frequency of DC braking	0.00~P0.07	0.00~P0.07	0.00Hz
P1.10	Waiting time before DC braking	0.0~50.0s	0.0~50.0	0.0s
P1.11	DC braking current	0.0~150.0%	0.0~150.0	0.0%
P1.12	DC braking time	0.0~50.0s	0.0~50.0	0.0s

Starting frequency of DC braking: Start the DC braking when running frequency reaches starting frequency determined by P1.09.

Waiting time before DC braking: Inverter blocks the output before starting the DC braking. After this waiting time, the DC braking will be started. It is used to prevent over-current fault caused by DC braking at high speed.

DC braking current: The value of P1.11 is the percentage of rated current of inverter. The bigger the DC braking current, the greater the braking torques.

DC braking time: The time used to perform DC braking. If the time is 0, the DC braking will be invalid.

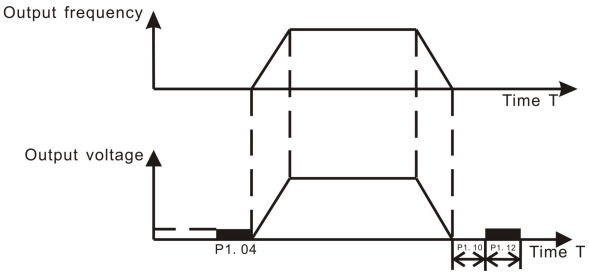


Figure 6-4 DC braking diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.13	Dead time of FWD/REV	0.0~3600.0s	0.0~3600.0	0.0s

Set the hold time at zero frequency in the transition between forward and reverse running.

It is shown as following figure:

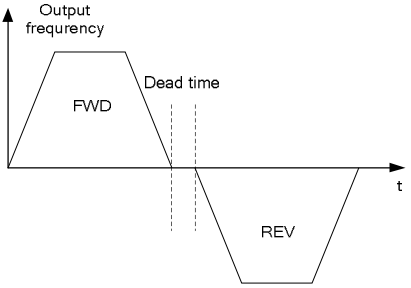


Figure 6-5 FWD/REV dead time diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.14	Action when running frequency is less than lower frequency limit	0: Running at the lower frequency limit 1: Stop 2: Stand-by	0~2	0

0: Running at the lower frequency limit (P0.09): The inverter runs at P0.09 when the running frequency is less than P0.09.

1: Stop: This parameter is used to prevent motor running at low speed for a long time.

2: Stand-by: Inverter will stand-by when the running frequency is less than P0.09. When the reference frequency is higher than or equal to P0.09 again, the inverter will start to run automatically.

Function Code	Name	Description	Setting Range	Factory Setting
P1.15	Restart after power off	0: Disabled 1: Enabled	0~1	0
P1.16	Delay time for restart	0.0~3600.0s	0.0~3600.0	0.0s

0: Disabled: Inverter will not automatically restart when power on again until run command takes effect.

1: Enabled: When inverter is running, after power off and power on again, if run command source is keypad control (P0.01=0) or communication control (P0.01=2), inverter will automatically restart after delay time determined by P1.16; if run command source is terminal control (P0.01=1), inverter will automatically restart after delay time determined by P1.16 only if FWD or REV is active.

Note:

- **If P1.15 is set to be 1, it is recommended that start mode should be set as speed tracing mode (P1.00=2).**
- **This function may cause the inverter restart automatically, please be cautious.**

6.3 P2 Group--Motor Parameters

Function Code	Name	Description	Setting Range	Factory Setting
P2.00	Inverter Model	0: Asynchronous motor 1: Synchronous motor	0~1	0

0: Applicable to asynchronous motor

1: Applicable to synchronous motor

Function Code	Name	Description	Setting Range	Factory Setting
P2.01	Motor rated power	0.4~1200.0kW	0.4~1200.0	Depend on model
P2.02	Motor rated speed	0~36000rpm	0~36000	1460rpm
P2.03	Motor rated voltage	0~500V	0~500	380V
P2.04	Motor rated current	0.1~2000.0A	0.1~2000.0	Depend on model
P2.05	Motor rated frequency	0.01Hz~P0.07	0.01~P0.07	50.00Hz

Note:

- **In order to achieve superior performance, please set these parameters according to motor nameplate, then perform autotuning.**
- **The power rating of inverter should match the motor. If the bias is too big, the control performances of inverter will be deteriorated distinctly.**
- **Reset P2.05 can initialize P2.06~P2.10 automatically.**

Function Code	Name	Description	Setting Range	Factory Setting
P2.06	Motor stator resistance	0.001~65.535Ω	0.001~65.535	Depend on model
P2.07	Motor rotor resistance	0.001~65.535Ω	0.001~65.535	Depend on model

Function Code	Name	Description	Setting Range	Factory Setting
P2.08	Motor leakage inductance	0.1~6553.5mH	0.1~6553.5	Depend on model
P2.09	Motor mutual inductance	0.1~6553.5mH	0.1~6553.5	Depend on model
P2.10	Current without load	0.01~655.35A	0.01~655.35	Depend on model
P2.11	Reserved			

After autotuning, the value of P2.06~P2.11 will be automatically updated.

Note: Do not change these parameters; otherwise it may deteriorate the control performance of inverter.

Function Code	Name	Description	Setting Range	Factory Setting
P2.12	Magnetic pole initial position	0.00~360.00	0.00~360.00	0.00
P2.13	Magnetic pole position amplitude gain	0.50~1.50	0.50~1.50	1
P2.14	C-phase magnetic pole position bias	0~9999	0~9999	433
P2.15	D-phase magnetic pole position bias	0~9999	0~9999	433

P2.12~P2.15 is valid only for synchronous motor.

Function Code	Name	Description	Setting Range	Factory Setting
P2.16	Motor weak magnetic coefficient	0.1~2.0	0.1~2.0	1.0
P2.17	Motor minimum weak magnetic limit	10.0~80.0	10.0~80.0	20.0

Motor is used under weak magnetic control.

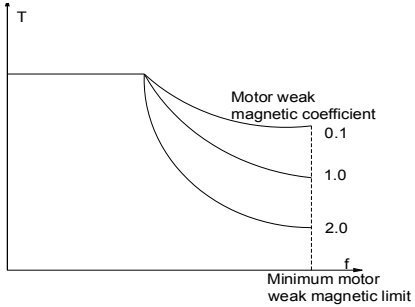


Figure 6.5 Motor weak magnetic

Function code P2.16 and P2.17 are valid for PG vector control. When motor speed is higher than rated speed, the motor is running into the weak magnetism. By modifying the weak magnetism control coefficient can change the curvature of weak magnetic curve, the greater of P2.16, the steeper of weak magnetic curve becomes, the smaller of P2.16 the flater weak magnetic curve becomes.

Function Code	Name	Description	Setting Range	Factory Setting
P2.18	Weak magnetic proportion	0~65535	0~65535	0

Appropriate adjustments of this parameter can improve the motor performance when motor is working under weak magnetic control. The adjusting range is 2000~5000.

Function Code	Name	Description	Setting Range	Factory Setting
P2.19	Motor output maximum voltage	P2.04~550V	P2.04~550	380V

Set the output maximum voltage of motor during the weak magnetic state.

Function Code	Name	Description	Setting Range	Factory Setting
P2.20	Motor temperature compensation	0~1	0~1	0

0: Disabled

1: Enabled

The motor parameters will change because of temperature during running, so it needs temperature compensation to stabilize the running performance.

Note: the function is only valid after installing the temperature sensor.

Function Code	Name	Description	Setting Range	Factory Setting
P2.21	Initial temperature of motor temperature compensation	0.0~60.0℃	0.0~60.0	40.0℃

Function Code	Name	Description	Setting Range	Factory Setting
P2.22	Motor temperature compensation coefficient	0.0~200.0	0.0~200.0	100.0

Function Code	Name	Description	Setting Range	Factory Setting
P2.23	Reserved	0~65535	0~65535	

6.4 P3 Group--Vector Control

Function Code	Name	Description	Setting Range	Factory Setting
P3.00	ASR proportional gain K_p1	0~100	0~100	20
P3.01	ASR integral time K_i1	0.01~10.00s	0.01~10.00	0.50s
P3.02	Low speed filter time	0.000~1.000s	0.000~1.000	0.000s
P3.03	ASR switching point 1	0.00Hz~P3.07	0.00~P3.07	5.00Hz
P3.04	ASR proportional gain K_p2	0~100	0~100	25
P3.05	ASR integral time K_i2	0.01~10.00s	0.01~10.00	1.00s
P3.06	High speed filter time	0.000~1.000s	0.000~1.000	0.000s
P3.07	ASR switching	P3.02~P0.07	P3.02~P0.07	10.00Hz

Function Code	Name	Description	Setting Range	Factory Setting
	point 2			

P3.00~P3.07 is only valid for vector control and torque control and invalid for V/F control. Through P3.00~P3.07, user can set the proportional gain K_p and integral time K_i of speed regulator (ASR), so as to change the speed response characteristic. ASR's structure is shown in following figure. P3.00 and P3.01 only take effect when output frequency is less than P3.03. P3.04 and P3.05 only take effect when output frequency is greater than P3.07.

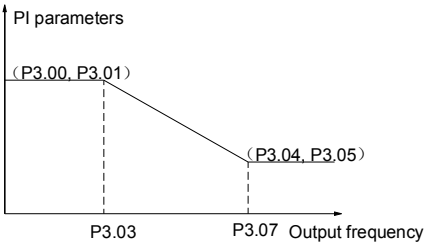


Figure 6-6 PI parameter diagram.

The system's dynamic response can be faster if the proportion gain K_p is increased;

However, if K_p is too large, the system tends to oscillate.

The system dynamic response can be faster if the integral time K_i is decreased;

However, if K_i is too small, the system becomes overshoot and tends to oscillate.

P3.00 and P3.01 are corresponding to K_p and K_i at low frequency, while P3.03 and P3.04 are corresponding to K_p and K_i at high frequency. Please adjust these parameters according to actual situation. The adjustment procedure is as follow:

- Increase the proportional gain K_p as far as possible without creating oscillation.
- Reduce the integral time K_i as far as possible without creating oscillation.

For more details about fine adjustment, please refer to description of P9 group.

Function Code	Name	Description	Setting Range	Factory Setting
P3.08	ACR proportional gain P	0~65535	0~65535	500
P3.09	ACR integral gain I	0~65535	0~65535	500

The bigger the proportional gain P, the faster the response, but oscillation may easily occur. If only proportional gain P is applied in regulation, the bias cannot be eliminated. In order to eliminate the bias, apply the integral gain I to achieve PI regulator.

Function Code	Name	Description	Setting Range	Factory Setting
P3.10	Driver side slip compensation coefficients	50~200%	50~200	100%
P3.11	Braking side slip compensation coefficients	50~200%	50~200	100%

Slip compensation coefficients is used to adjust slip frequency of vector control and improve control accuracy of system speed. Adjust the parameters appropriately; speed static error can be restrained effectively. P3.10 is valid for electric state and P3.11 is valid for regenerative braking state.

Function Code	Name	Description	Setting Range	Factory Setting
P3.12	Torque setting source	0: Disabled 1: Keypad 2: AI1 3: AI2 4: 485 communication 5: Profibus communication 6: HDI 7:CAN 8: Reserved	0~7	0
P3.13	Keypad torque setting	-100.0~100.0%	-100.0~100.0	50.0%
P3.14	Torque upper limit	0.0~200.0%	0.0~200.0	150.0%

0: Torque control is disabled. Inverter will run at speed control mode. Output torque of inverter which should not greater than torque limit (P3.14) matches the torque of load automatically. When the torque of load is greater than torque limit, output torque will remain as torque limit and output frequency will decrease automatically.

1~8: Torque control is enabled.

When torque control takes effect,

If $T_{set} > T_{load}$, output frequency will increase continuously until it reaches upper frequency limit.

If $T_{set} < T_{load,}$ output frequency will decrease continuously until it reaches lower frequency limit.

Inverter can run at any frequency between upper and lower frequency limit only when T_{set} =T_{load}.

Function Code	Name	Description	Setting Range	Factory Setting
P3.15	Torque upper limit method selection	0: Keypad(maximum torque is set up by P3.14) 1: Profibus 2: AI1 3: AI2 4: HDI1 5: CAN 6: 485 communication	0~6	0
P3.16	Torque control prohibition access selection	0: Torque control prohibition is invalid 1: Terminal torque control prohibition is valid 2: Profibus torque control prohibition is valid 3: CAN torque control prohibition is valid 4: Three controls are valid	0~4	0

This function of P3.16 is mainly used in inverter torque control mode to achieve the switch between speed control mode and torque control mode.

0: Torque control prohibition is invalid

As long as P3.12 ≠ 0, torque control is valid.

1: Terminal torque control prohibition is valid

When P3.12 ≠ 0, terminal function can be used to prohibit torque control.

2: Profibus torque control prohibition is valid

3: CAN torque control prohibition is valid

The terminal torque control prohibition is invalid when P3.16 = 2.

4: Three controls are valid

Function Code	Name	Description	Setting Range	Factory Setting
P3.17	Forward torque	0.00~P0.07	0.00~P0.07	50.00Hz

Function Code	Name	Description	Setting Range	Factory Setting
	upper frequency limit			

This function is used to set the maximum frequency when torque control.

Function Code	Name	Description	Setting Range	Factory Setting
P3.18	Forward torque upper frequency limit	0: Keyboard 1: AI1 2: AI2 3: HDI 4: 485 Communications 5: Profibus communication 6: CAN communication	0~6	0

When Forward torque upper frequency limit is 0, maximum frequency is set by the function code P3.17.

Function Code	Name	Description	Setting Range	Factory Setting
P3.19	Reverse torque upper frequency limit	0.00~P0.07	0.00~P0.07	50.00HZ
P3.20	Reverse torque upper frequency setting	0: Keypad 1: AI1 2: AI2 3: HDI 4: 485 communication 5: Profibus-DP	0~5	0
P3.21	Proportional coefficient of high frequency current loop	0~65535	0~65535	1000
P3.22	Integral coefficient of high frequency current loop	0~65535	0~65535	1000
P3.23	Encoder type	0: Incremental encoder	0~2	0

Function Code	Name	Description	Setting Range	Factory Setting
		1: SIN/COS encoder 2: UVW encoder		

Encoder wiring diagram please refer to figure 7.2 and 7.3.

Note: P2.00 = 0 (asynchronous motor), incremental encoder is the only choice; P2.00=1 (synchronous motor), SIN/COS and UVW-type encoders are valid.

Function Code	Name	Description	Setting Range	Factory Setting
P3.24	Encoder pulse	1~65535	1~65535	1000
P3.25	Encoder direction	0~1	0~1	0

Note: Encode parameters (P3.24) must be set properly under vector control with PG Card, otherwise the motor can't run properly. After encoder parameters setting, inverter still can't work, please change the encoder direction (P3.25).

Function Code	Name	Description	Setting Range	Factory Setting
P3.26	Low-speed, encoder disconnection detection time	0.0~100.0s	0.0~100.0	1.0s
P3.27	High-speed, encoder disconnection detection time	0.0~100.0s	0.0~100.0	1.0s
P3.28	Encoder reverse detection time	0.0~100.0s	0.0~100.0	1.0s

P3.26 and P3.27 define encoder disconnection fault detection time, when the encoder disconnection time is longer than set time, inverter shows PCE, P3.26 corresponds to low-speed segment and P3.27 corresponds to high-speed segment.

P3.28 defines encoder reverse fault detection time, when the encoder reverse time is longer than corresponding reverses detection time, system shows PCDE.

Note: The adjustment of these parameters will affect the sensitivity of the encoder fault protection, sometimes even appears abnormal movements, please carefully adjust.

Function Code	Name	Description	Setting Range	Factory Setting
P3.29	Reserved	0~65535	0~65535	
P3.30	Reserved	0~65535	0~65535	
P3.31	Reserved	0~65535	0~65535	
P3.32	Reserved	0~65535	0~65535	

6.5 P4 Group --V/F Control

Function Code	Name	Description	Setting Range	Factory Setting
P4.00	V/F curve selection	0:Linear curve 1: User-defined curve 2: Torque_stepdown curve (1.3 order) 3: Torque_stepdown curve (1.7 order) 4: Torque_stepdown curve (2.0 order) 5: V/F seperation	0~5	0

0: Linear curve. It is applicable for normal constant torque load.

1: User-defined curve. It can be defined through setting (P4.03~P4.08).

2~4: Torque_stepdown curve. It is applicable for variable torque load, such as blower, pump and so on. Please refer to following figure.

5: V/F seperation

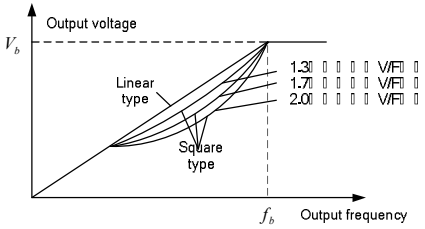


Figure 6-7 Multiple V/F curve diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.01	Torque boost	0.0%: auto 0.1%~10.0%	0.0~10.0	1.0%
P4.02	Torque boost	0.0%~50.0%	0.0~50.0	20.0%

Function Code	Name	Description	Setting Range	Factory Setting
	cut-off	(motor rated frequency)		

Torque boost will take effect when output frequency is less than cut-off frequency of torque boost (P4.02). Torque boost can improve the torque performance of V/F control at low speed. The value of torque boost should be determined by the load. The heavier the load, the larger the value.

Note: This value should not be too large, otherwise the motor would be over-heat or the inverter would be tripped by over-current or over-load.

If P4.01 is set to 0, the inverter will boost the output torque according to the load automatically. Please refer to following diagram.

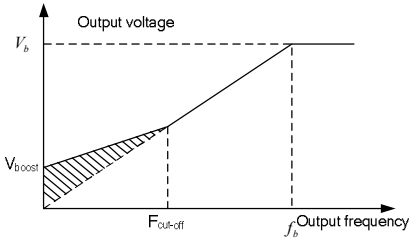


Figure 6-8 Torque boost diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.03	V/F frequency 1	0.00Hz~ P4.05	0.00~P4.05	5.00Hz
P4.04	V/F voltage 1	0.0%~100.0%	0.0~100.0	10.0%
P4.05	V/F frequency 2	P4.03~ P4.07	P4.03~ P4.07	10.00Hz
P4.06	V/F voltage2	0.0%~100.0%	0.0~100.0	20.0%
P4.07	V/F frequency 3	P4.05~ P2.01	P4.05~ P2.01	30.00Hz
P4.08	V/F voltage 3	0.0%~100.0%	0.0~100.0	60.0%

This function is only active when P4.00 is set to be 1. P4.03~P4.08 are used to set the user-defined V/F curve. The value should be set according to the load characteristic of motor.

Note:

- **0＜V1＜V2＜V3＜rated voltage.**
- **0＜f1＜f2＜f3＜rated frequency.**
- **The voltage corresponding to low frequency should not be set too high, otherwise**

it may cause motor overheat or inverter fault

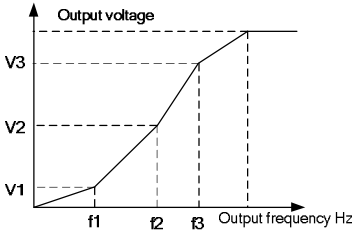


Figure 6-9 V/F curve setting diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.09	V/F slip compensation	0.00~10.00Hz	0.00~10.00	0.0Hz

The motor's slip changes with the load torque, which results in the variance of motor speed. The inverter's output frequency can be adjusted automatically through slip compensation according to the load torque. Therefore the change of speed due to the load change can be reduced. The value of compensated slip is dependent on the motor's rated slip which can be calculated as: P4.09=fb-n*p/60. Where fb is motor rated frequency (P2.01), n is motor rated speed (P2.02), and p is pole pairs of motor.

Function Code	Name	Description	Setting Range	Factory Setting
P4.10	AVR function	0: Disabled 1: Enabled all the time 2: Disabled during deceleration	0~2	1

AVR (Auto Voltage Regulation) function ensures the output voltage of inverter stable no matter how the DC bus voltage changes. During deceleration, if AVR function is disabled, the deceleration time will be short but the current will be big. If AVR function is enabled all the time, the deceleration time will be long but the current will be small.

Function Code	Name	Description	Setting Range	Factory Setting
P4.11	Auto energy saving selection	0: Disabled 1: Enabled	0~1	0

When P4.11 is set to be 1, while there is a light load, it will reduce the inverter output voltage and saves energy.

Function Code	Name	Description	Setting Range	Factory Setting
P4.12	Terminal detection when power on	0: Command invalid 1: Command valid	0~1	0

Function Code	Name	Description	Setting Range	Factory Setting
P4.13	Output voltage reference	0:P4.14 1:AI1 2:AI2 3:Modbus communication (0x2006)	0~3	0

Function Code	Name	Description	Setting Range	Factory Setting
P4.14	Output voltage keypad reference	0.0~100.0%	0.0~100.0	100.0%

When P4.13 =0, the voltage is set by the keypad.

Note: 100.0% corresponds to P2.04.

Function Code	Name	Description	Setting Range	Factory Setting
P4.15	Mini output voltage	0.0~100.0%	0.0~100.0	0.0%

Note: 100.0% corresponds to P2.04.

Function Code	Name	Description	Setting Range	Factory Setting
P4.16	Reserved	0~65535	0~65535	
P4.17	Reserved	0~65535	0~65535	
P4.18	Reserved	0~65535	0~65535	
P4.19	Reserved	0~65535	0~65535	

6.6 P5 Group--Input Terminals

Function Code	Name	Description	Setting Range	Factory Setting
P5.00	HDI selection	0: HDI1 as high speed pulse	0~1	0

Function Code	Name	Description	Setting Range	Factory Setting
		input 1: HDI1 is ON-OFF input		

Function Code	Name	Description	Setting Range	Factory Setting
P5.01	Communication Input selection	0: Concrete 1: Virtual	0~1	0

0: ON-OFF signal is input through external input terminals.

1: ON-OFF signal is set through serial communication by host device.

Function Code	Name	Description	Setting Range	Factory Setting
P5.02	S1 Terminal function	Programmable multifunction terminal	0~40	1
P5.03	S2 Terminal function	Programmable multifunction terminal	0~40	4
P5.04	S3 Terminal function	Programmable multifunction terminal	0~40	7
P5.05	S4 Terminal function	Programmable multifunction terminal	0~40	0
P5.06	S5 Terminal function	Programmable multifunction terminal	0~40	0
P5.07	HDI1 terminal function	Programmable multifunction terminal	0~40	0
P5.08	S7 Terminal function	Programmable multifunction terminal	0~40	0
P5.09	S8 Terminal function	Programmable multifunction terminal	0~40	0
P5.10	S9 Terminal function	Programmable multifunction terminal	0~40	0
P5.11	S10 Terminal function	Programmable multifunction terminal	0~40	0

The meaning of each setting is shown in following table.

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td>0</td><td>Invalid</td><td>Please set unused terminals to be invalid to avoid malfunction.</td></tr>
<tr><td>1</td><td>Forward</td><td rowspan="2">Please refer to description of P5.13.</td></tr>
<tr><td>2</td><td>Reverse</td></tr>
<tr><td>3</td><td>3-wire control</td><td>Please refer to description of P5.13.</td></tr>
<tr><td>4</td><td>Jog forward</td><td rowspan="2">Please refer to description of P8.06~P8.08.</td></tr>
<tr><td>5</td><td>Jog reverse</td></tr>
<tr><td>6</td><td>Coast to stop</td><td>The inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.</td></tr>
<tr><td>7</td><td>Reset fault</td><td>Resets faults that have occurred. It has the same function as STOP/RST.</td></tr>
<tr><td>8</td><td>Pause running</td><td>When this terminal takes effect, inverter decelerates to stop and save current state, such as PLC, traverse frequency and PID. When this terminal takes no effect, inverter restores the state before pause.</td></tr>
<tr><td>9</td><td>External fault input</td><td>Stop the inverter and output a alarm when a fault occurs in a peripheral device.</td></tr>
<tr><td>10</td><td>Up command</td><td rowspan="3">The reference frequency of inverter can be adjusted by UP command and DOWN command.

Use this terminal to clear UP/DOWN setting. Please refer to description of P0.02.</td></tr>
<tr><td>11</td><td>DOWN command</td></tr>
<tr><td>12</td><td>Clear UP/DOWN</td></tr>
<tr><td>13</td><td>Switch between A and B</td><td rowspan="3"><table>
<tr><th>P0.06
Terminal action</th><th>A</th><th>B</th><th>A+B</th></tr>
<tr><td>13 valid</td><td>B</td><td>A</td><td></td></tr>
<tr><td>14 valid</td><td>A+B</td><td></td><td>A</td></tr>
<tr><td>15 valid</td><td></td><td>A+B</td><td>B</td></tr>
</table></td></tr>
<tr><td>14</td><td>Switch between A and A+B</td></tr>
<tr><td>15</td><td>Switch between B and A+B</td></tr>
</table>

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td>16</td><td>Multi-step speed reference1</td><td rowspan="4">16 steps speed control can be realized by the combination of these four terminals. For details, please refer to following multi-step speed reference terminal state and according step value table:
Such as:
0000: select the multi-speed 0; 1111: multi-speed 15.
Note: multi-speed 1 is low bit, and multi-speed 4 is high bit.
<table><tr><td>Multi-speed terminal 4</td><td>Multi-speed terminal 3</td><td>Multi-speed terminal 2</td><td>Multi-speed terminal 1</td></tr><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr></table></td></tr>
<tr><td>17</td><td>Multi-step speed reference 2</td></tr>
<tr><td>18</td><td>Multi-step speed reference 3</td></tr>
<tr><td>19</td><td>Multi-step speed reference 4</td></tr>
<tr><td>20</td><td>Multi-step speed pause</td><td>Can shield the function of multi-speed terminals and keep the set value as the current state.</td></tr>
<tr><td>21</td><td>ACC/DEC time selection1</td><td rowspan="2">4 groups of ACC/DEC time can be selected by the combination of these two terminals.
<table><tr><th>ACC/DEC time selection 2</th><th>ACC/DEC time selection1</th><th>ACC/DEC time</th></tr><tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 0 (P0.11, P0.12)</td></tr><tr><td>OFF</td><td>ON</td><td>ACC/DEC time 1 (P8.00, P8.01)</td></tr><tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2 (P8.02, P8.03)</td></tr><tr><td>ON</td><td>ON</td><td>ACC/DEC time 3 (P8.04, P8.05)</td></tr></table></td></tr>
<tr><td>22</td><td>ACC/DEC time selection 2</td></tr>
<tr><td>23</td><td>Reset simple PLC when stop</td><td>When simple PLC stops, the state of PLC such as running step, running time and running frequency will be cleared when this terminal is enabled.</td></tr>
<tr><td>24</td><td>Pause simple PLC</td><td>Inverter runs at zero frequency and PLC pauses the timing when this terminal is enabled. If this terminal is disabled, inverter will start and continue the PLC operation from the state before pause.</td></tr>
</table>

Setting value	Function	Description
25	Pause PID	PID adjustment will be paused and inverter keeps output frequency unchanged.
26	Pause traverse operation	Inverter keeps output frequency unchanged. If this terminal is disabled, inverter will continue traverse operation from current frequency.
27	Reset traverse operation	Reference frequency of inverter will be forced as center frequency of traverse operation.
28	Reset counter	Clear the value of counter.
29	Reset length	Clear the value of actual length (P8.20).
30	ACC/DEC ramp hold	Pauses acceleration or deceleration and maintains output frequency. When this terminal is disabled, acceleration/deceleration is restarted.
31	Disable torque control	Torque control is disabled. Inverter will work in speed control mode.
32	3-wire jogging control	Combinate with the FWD and REV running terminal.
33	Switch to keypad running	Switch to keypad running when the termina is valid.
34	Switch to terminal running	Switch to terminal running when the termina is valid.
35	Switch to 485 communication running	Switch to 485 communication running when the termina is valid.
36	Switch to profibus communication running	Switch to profibus communication running when the termina is valid.
37	Switch to CAN communication running	Switch to CAN communication running when the termina is valid.
38~40	Reserved	Reserved

Function Code	Name	Description	Setting Range	Factory Setting
P5.12	ON-OFF filter times	0~10	0~10	5

This parameter is used to set filter strength of terminals (S1~S8, HDI1, HDI2). When interference is heavy, user should increase this value to prevent malfunction.

Function Code	Name	Description	Setting Range	Factory Setting
P5.13	Terminal control mode	0: 2-wire control mode 1 1: 2-wire control mode 2 2: 3-wire control mode 1 3: 3-wire control mode 2	0~3	0

This parameter defines four different control modes that control the inverter operation through external terminals.

0: 2-wire control mode 1: Integrate START/STOP command with run direction.

K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	REV
ON	ON	Stop

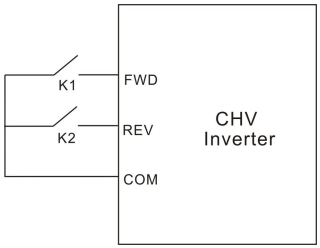


Figure 6-10 2-wire control mode 1.

1: 2-wire control mode 2: START/STOP command is determined by FWD terminal. Run direction is determined by REV terminal.

K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	Stop
ON	ON	REV

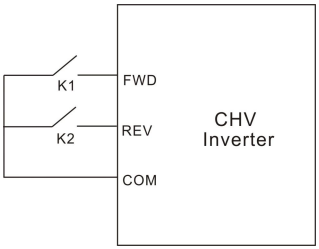


Figure 6-11 2-wire control mode 2.

2: 3-wire control mode 1: SB1: Start button. SB2: Stop button (NC), K: Run direction button, Terminal SIn is the multifunctional input terminal of S1~S8, HDI1 and HDI2. The terminal function should be set to be 3 (3-wire control).

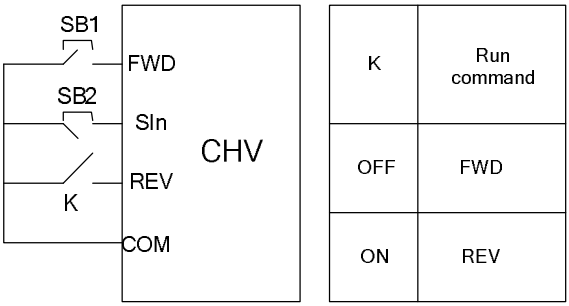


Figure 6-12 3-wire control modes 1.

3: 3-wire control mode 2:

SB1: Forward run button

SB2: Stop button (NC)

SB3: Reverse run button

Terminal SIn is the multifunctional input terminal of S1~S8, HDI1 and HDI2. The terminal function should be set to be 3 (3-wire control).

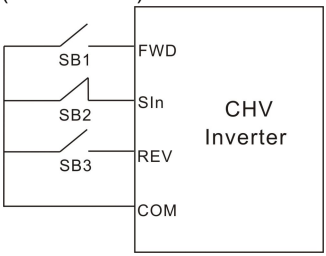


Figure 6-13 3-wire control modes 2.

Note:

- **When 2-wire control mode is active, the inverter will not run in following situation even if FWD/REV terminal is enabled:**
- **Coast to stop (press RUN and STOP/RST at the same time).**
- **Stop command from serial communication.**
- **FWD/REV terminal is enabled before power on. Please refer to description of P4.12.**

Function Code	Name	Description	Setting Range	Factory Setting
P5.14	UP/DOWN setting change rate	0.01~50.00Hz/s	0.01~50.00	0.50Hz/s

This parameter is used to determine how fast UP/DOWN setting changes.

Function Code	Name	Description	Setting Range	Factory Setting
P5.15	AI1 lower limit	0.00V~10.00V	0.00~10.00	0.00V
P5.16	AI1 lower limit corresponding setting	-100.0%~100.0%	-100.0~100.0	0.0%
P5.17	AI1 upper limit	0.00V~10.00V	0.00~10.00	10.00V
P5.18	AI1 upper limit corresponding setting	-100.0%~100.0%	-100.0~100.0	100.0%
P5.19	AI1 filter time constant	0.00s~10.00s	0.00~10.00	0.10s

These parameters determine the relationship between analog input voltage and the corresponding setting value. When the analog input voltage exceeds the range between lower limit and upper limit, it will be regarded as the upper limit or lower limit.

The analog input AI1 can only provide voltage input, and the range is 0V~5V.

For different applications, the corresponding value of 100.0% analog setting is different. For details, please refer to description of each application.

Note: AI1 lower limit must be less or equal to AI1 upper limit.

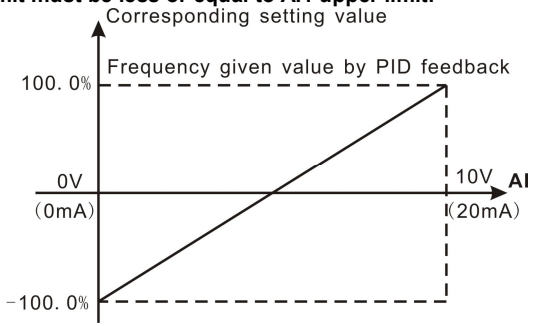


Figure 6-14 Relationship between AI and corresponding setting.

Function Code	Name	Description	Setting Range	Factory Setting
P5.20	AI2 lower limit	0.00V~10.00V	0.00~10.00	0.00V
P5.21	AI2 lower limit corresponding setting	-100.0%~100.0%	-100.0~100.0	0.0%

Function Code	Name	Description	Setting Range	Factory Setting
P5.22	AI2 upper limit	0.00V~10.00V	0.00~10.00	5.00V
P5.23	AI2 upper limit corresponding setting	-100.0%~100.0%	-100.0~100.0	100.0%
P5.24	AI2 filter time constant	0.00s~10.00s	0.00~10.00	0.10s
P5.25	HDI1 selection	0: Setting input 1: Counting input 2: Length input 3~4: Reserved	0~4	0
P5.26	HDI1 lower limit frequency	0Hz~50.0kHz	0Hz~50.0	0.0kHz
P5.27	HDI1 lower limit frequency corresponding setting	-100.0~100.0	-100.0~100.0	0.0%
P5.28	HDI1 upper limit frequency	0Hz~50.0kHz	0Hz~50.0	0.0kHz
P5.29	HDI1 upper limit frequency corresponding setting	-100.0~100.0	-100.0~100.0	100.0%
P5.30	HDI1 frequency filter time constant	0.00s~10.00s	0.00~10.00	0.10s
P5.31	Terminal input	0~0x3FF	0~0x3FF	0
P5.32~ P5.35	Reserved	Reserved		

6.7 P6 Group -- Output Terminals

Function Code	Name	Description	Setting Range	Factory Setting
P6.00	HDO selection	0: High-speed pulse output 1: ON-OFF output	0~1	0

0: High-speed pulse output: The maximum pulse frequency is 50.0 kHz. Please refer to description of P6.09.

1: ON-OFF output: Please refer to description of P6.03.

Note: The output of HDO terminal is multi-function ON-OFF output.

Function Code	Name	Description	Setting Range	Factory Setting
P6.01	Y1 output selection	Open-collector output	0~30	1
P6.02	Y2 output selection	Open-collector output	0~30	0
P6.03	HDO ON-OFF output selection	Open-collector output	0~30	0
P6.04	Relay 1 output selection	Relay output	0~30	4
P6.05	Relay 2 output selection	Relay output	0~30	5
P6.06	Relay 3 output selection	Relay output	0~30	0

OC/Relay output functions are indicated in the following table:

Setting Value	Function	Description
0	No output	Output terminal has no function.
1	Run forward	ON: During forward run.
2	Run reverse	ON: During reverse run.
3	Fault output	ON: Inverter is in fault state.
4	Motor overload	Please refer to description of Pb.04~Pb.06.
5	Inverter overload	Please refer to description of Pb.04~Pb.06.
6	FDT reached	Please refer to description of P8.25, P8.26.
7	Frequency reached	Please refer to description of P8.27.
8	Zero speed running	ON: The running frequency of inverter is zero.
9	Preset count value reached	Please refer to description of P8.22.
10	Specified count	Please refer to description of P8.23.

Setting Value	Function	Description
	value reached	
11	Length reached	ON: Actual length (P8.20) reaches the value of P8.19.
12	PLC cycle completed	After simple PLC completes one cycle, inverter will output ON signal for 200ms.
13	Running time reached	ON: The accumulated running time of inverter reaches the value of P8.24.
14	Upper frequency limit reached	ON: Running frequency reaches the value of P0.08.
15	Lower frequency limit reached	ON: Running frequency reaches the value of P0.09.
16	Ready	ON: Inverter is ready (no fault, power is ON).
17	Auxiliary motor 1 started	In the case of simple water supply system with one inverter driving three pumps, it is used to control auxiliary pumps. For details, please refer to descriptions of P8.29, P8.30 and P8.31.
18	Auxiliary motor 2 started	
19	Motor running	ON: Inverter has output signal
20	Stop pulse output	Output pulse signal for 2s when running frequency is lower than 0.1Hz
21~31	Reserved	Reserved

Function Code	Name	Description	Setting Range	Factory Setting
P6.07	AO1 function selection	Multifunctional analog output	0~14	0
P6.08	AO2 function selection	Multifunctional analog output	0~14	1
P6.09	HDO function selection	Multifunctional high-speed pulse output	0~14	0

AO/HDO output functions are indicated in the following table:

Setting Value	Function	Range

Setting Value	Function	Range
0	Running frequency	0~maximum frequency (P0.07)
1	Reference frequency	0~ maximum frequency (P0.07)
2	Motor speed	0~2* rated synchronous speed of motor
3	Output current	0~2* inverter rated current
4	Output voltage	0~2* inverter rated voltage
5	Output power	0~2* rated power
6	Output torque	0~2*rated torque
7	AI1 voltage	0~10V
8	AI2 voltage/current	0~10V/0~20mA
9	Ramp reference frequency	0~ maximum frequency (P0.07)
10	Reserved	
11	HDI1 frequency	0.1~50.0kHz
12	Reserved	
13	Length value	0~preset length (P8.19)
14	Count value	0~preset count value (P8.22)

Function Code	Name	Description	Setting Range	Factory Setting
P6.10	AO1 lower limit	0.0%~100.0%	0.0~100.0	0.0%
P6.11	AO1 lower limit corresponding output	0.00V ~10.00V	0.00~10.00	0.00V
P6.12	AO1 upper limit	0.0%~100.0%	0.0~100.0	100.0%
P6.13	AO1 upper limit corresponding output	0.00V ~10.00V	0.00~10.00	10.00V
P6.14	AO2 lower limit	0.0%~100.0%	0.0~100.0	0.0%
P6.15	AO2 lower limit corresponding output	0.00V ~10.00V	0.00~10.00	0.00V
P6.16	AO2 upper limit	0.0%~100.0%	0.0~100.0	100.0%

Function Code	Name	Description	Setting Range	Factory Setting
P6.17	AO2 upper limit corresponding output	0.00V ~10.00V	0.00~10.00	10.00V

These parameters determine the relationship between analog output voltage/current and the corresponding output value. When the analog output value exceeds the range between lower limit and upper limit, it will output the upper limit or lower limit.

When AO is current output, 1mA is corresponding to 0.5V.

For different applications, the corresponding value of 100.0% analog output is different. For details, please refer to description of each application.

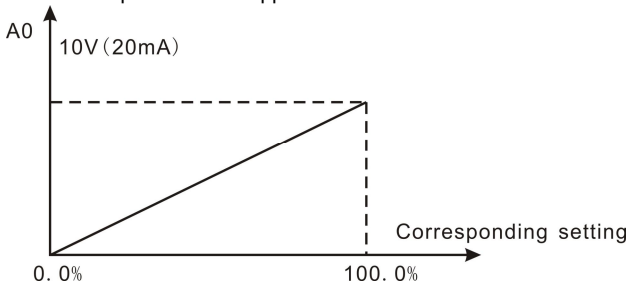


Figure 6-15 Relationship between AO and corresponding setting.

Function Code	Name	Description	Setting Range	Factory Setting
P6.18	AO3 lower limit	0.0%~100.0%	0.0~100.0	0.0%
P6.19	HDO lower limit corresponding output	0.0 ~ 50.0kHz	0.0~50.0	0.0kHz
P6.20	AO3 upper limit	0.0%~100.0%	0.0~100.0	100.0%
P6.21	HDO upper limit corresponding output	0.0 ~ 50.0kHz	0.0~50.0	50.0kHz

The description of P6.18~P6.21 is similar to AO.

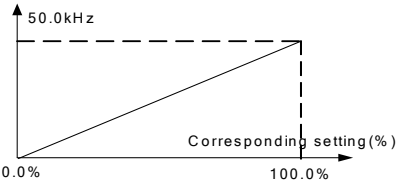


Figure 6-16 Relationship between HDO and corresponding setting.

6.8 P7 Group -- Human machine interface

Function Code	Name	Description	Setting Range	Factory Setting
P7.00	User password	0~65535	0~65535	0

The password protection function will be valid when set to be any non-zero data. When P7.00 is set to be 00000, user's password set before will be cleared and the password protection function will be disabled.

After the password has been set and becomes valid, the user can not access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.

Function Code	Name	Description	Setting Range	Factory Setting
P7.01	LCD language selection	0: Chinese 1: English	0~1	0
P7.02	Parameter copy	0: Invalid 1: Upload parameters to LCD 2: Download parameters from LCD	0~2	0

P7.02 will take effect when LCD keypad is used.

1: All value of parameters will be uploaded from inverter to LCD.

2: All value of parameters will be downloaded from LCD to inverter.

Note: When upload or download operation completes, P7.02 will be set to 0 automatically.

Function Code	Name	Description	Setting Range	Factory Setting
P7.03	QUICK/JOG function selection	0: Quick debugging mode 1: FDW/REV switching	0~3	0

Function Code	Name	Description	Setting Range	Factory Setting
		2: Jog 3: Clear UP/DOWN setting		

QUICK/JOG is a multifunctional key, whose function can be defined by the value of P7.03.

0: Quick debugging mode: Please refer to description of Chapter 5.

1: FWD/REV switching: Press QUICK/JOG, the running direction of inverter will reverse. It is only valid if P0.01 is set to be 0.

2: Jog: Press QUICK/JOG , the inverter will jog.

3: Clear UP/DOWN setting: Press QUICK/JOG, the UP/DOWN setting will be cleared.

Function Code	Name	Description	Setting Range	Factory Setting
P7.04	STOP/RST function selection	0: Valid when keypad control (P0.01=0) 1: Valid when keypad or terminal control (P0.01=0 or 1) 2: Valid when keypad or communication control (P0.01=0 or 2) 3: Always valid	0~3	0

Note:

- **The value of P7.04 only determines the STOP function of STOP/RST.**
- **The RESET function of STOP/RST is always valid.**

Function Code	Name	Description	Setting Range	Factory Setting
P7.05	Motor temperature			

The function code display motor temperature.

Function Code	Name	Description	Setting Range	Factory Setting
P7.06	Running state display selection	0~0xFFFF	0~0xFFFF	0x0003

P7.06 defines the parameters that can be displayed by LED in running status. If Bit is 0, the parameter will not be displayed; If Bit is 1, the parameter will be displayed.

Press >>/SHIFT to scroll through these parameters in right order.

Press DATA/ENT + QUICK/JOG to scroll through these parameters in left order.

The displayed content corresponds to each bit of P7.06 is described in the following table:

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10
Counting value	Length value	PLC and steps of multi-speed running	Reserved	HDI pulse frequency	Reserved
BIT9	BIT8	BIT7	BIT6	BIT5	BIT4
Reserved	AI2	AI1	Output terminal state	Intput terminal state	PID feedback value
BIT3	BIT2	BIT1	BIT0		
PID reference value	Output torque	Output power	Speed		

Input/output terminal status display inverter input/output terminal signal status at current time, close corresponds to 1, disconnection corresponds to 0. The entire data is displayed as Decimal. Please refer to P7.19, P7.20 for specific description.

Function Code	Name	Description	Setting Range	Factory Setting
P7.07	Stop status display selection	0x0001~0xFFFF	0x0001~0xFFFF	0x00FF

P7.07 determines the display parameters in stop status. The setting method is similar with P7.06.

The display content corresponding to each bit of P7.07 is described in the following table:

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10
Reserved	Counting value	Length value	PLC and steps of multi-speed running	Reserved	HDI1 pulse frequency
BIT9	BIT8	BIT7	BIT6	BIT5	BIT4
Reserved	Reserved	AI2	AI1	PID feedback value	PID reference value
BIT3	BIT2	BIT1	BIT0		
Output terminal	Intput	Bus voltage	Set		

state	terminal state		frequency

Function Code	Name	Description	Setting Range	Factory Setting
P7.08	Rectifier module temperature	0~150.0℃	0~150.0	
P7.09	IGBT module temperature	0~150.0℃	0~150.0	
P7.10	MCU software version			
P7.11	DSP software version			
P7.12	Accumulated running time	0~65535h	0~65535	

Rectifier module temperature: Indicates the temperature of rectifier module. Overheat protection point of different inverter may be different.

IGBT module temperature: Indicates the temperature of IGBT module. Overheat protection point of different inverter may be different.

MCU software version: Indicates current software version of MCU.

DSP software version: Indicates current software version of DSP

Accumulated running time: Displays accumulated running time of inverter.

Note: Above parameters are read only.

Function Code	Name	Description	Setting Range	Factory Setting
P7.13	Previous two fault type	0~50	0~50	0
P7.14	Previous fault type	0~50	0~50	0
P7.15	Current fault type	0~50	0~50	0

These parameters record three recent fault types. 0 means that there is no fault and 1~40 means that there are different fault types. Please refer to description for details.

Function Code	Name	Description	Setting Range	Factory Setting
P7.16	Output frequency	Output frequency at current fault.		0

<table>
<tr><th>Function Code</th><th>Name</th><th>Description</th><th>Setting Range</th><th>Factory Setting</th></tr>
<tr><td></td><td>at current fault</td><td></td><td></td><td></td></tr>
<tr><td>P7.17</td><td>Output current at current fault</td><td>Output current at current fault.</td><td></td><td></td></tr>
<tr><td>P7.18</td><td>DC bus voltage at current fault</td><td>DC bus voltage at current fault.</td><td></td><td></td></tr>
<tr><td>P7.19</td><td>Input terminal status at current fault</td><td>This value records ON-OFF input terminal status at current fault. The meaning of each bit is as below:
<table><tr><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>S10</td><td>S9</td><td>S8</td><td>S7</td><td>HDI1</td><td>S5</td><td>S4</td><td>S3</td><td>S2</td><td>S1</td></tr></table>1 indicates corresponding input terminal is ON, while 0 indicates OFF.
Note: This value is displayed as decimal.</td><td></td><td></td></tr>
<tr><td>P7.20</td><td>Output terminal status at current fault</td><td>This value records output terminal status at current fault. The meaning of each bit is as below:
<table><tr><td>BIT5</td><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO3</td><td>RO2</td><td>RO1</td><td>HDO</td><td>Y2</td><td>Y1</td></tr></table>1 indicates corresponding output terminal is ON, while 0 indicates OFF.
Note: This value is displayed as decimal.</td><td></td><td></td></tr>
<tr><td>P7.21</td><td>Inverter rated power</td><td></td><td></td><td></td></tr>
<tr><td>P7.22</td><td>Inverter rated current</td><td></td><td></td><td></td></tr>
<tr><td>P7.23</td><td>Reserved</td><td>0~65535</td><td>0~65535</td><td></td></tr>
</table>

Function Code	Name	Description	Setting Range	Factory Setting
P7.24	Reserved	0~65535	0~65535	
P7.25	Reserved	0~65535	0~65535	
P7.26	Reserved	0~65535	0~65535	

6.9 P8 Group --Enhanced Function

Function Code	Name	Description	Setting Range	Factory Setting
P8.00	Acceleration time 1	0.0~3600.0s	0.0~3600.0	20.0s
P8.01	Deceleration time 1	0.0~3600.0s	0.0~3600.0	20.0s
P8.02	Acceleration time 2	0.0~3600.0s	0.0~3600.0	20.0s
P8.03	Deceleration time 2	0.0~3600.0s	0.0~3600.0	20.0s
P8.04	Acceleration time 3	0.0~3600.0s	0.0~3600.0	20.0s
P8.05	Deceleration time 3	0.0~3600.0s	0.0~3600.0	20.0s

For details, please refer to description of P0.11 and P0.12.

Function Code	Name	Description	Setting Range	Factory Setting
P8.06	Jog reference	0.00~P0.07	0.00~ P0.07	5.00Hz
P8.07	Jog acceleration time	0.0~3600.0s	0.0~3600.0	20.0s
P8.08	Jog deceleration time	0.0~3600.0s	0.0~3600.0	20.0s

The meaning and factory setting of P8.07 and P8.08 is the same as P0.11 and P0.12. No matter what the value of P1.00 and P1.08 are, jog will start as start directly mode and stop as deceleration to stop mode.

Function Code	Name	Description	Setting Range	Factory Setting
P8.09	Skip frequency 1	0.00~P0.07	0.00~P0.07	0.00Hz
P8.10	Skip frequency 2	0.00~P0.07	0.00~P0.07	0.00Hz
P8.11	Skip frequency bandwidth	0.00~P0.07	0.00~P0.07	0.00Hz

By means of setting skip frequency, the inverter can keep away from the mechanical resonance with the load. P8.09 and P8.10 are centre value of frequency to be skipped.

Note:

- **If P8.11 is 0, the skip function is invalid.**
- **If both P8.09 and P8.10 are 0, the skip function is invalid no matter what P8.11 is.**
- **Operation is prohibited within the skip frequency bandwidth, but changes during acceleration and deceleration are smooth without skip.**

The relation between output frequency and reference frequency is shown in following figure.

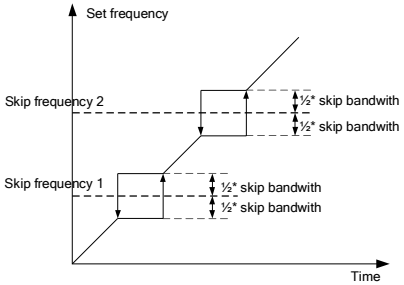


Figure 6-17 Skip frequency diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.12	Traverse amplitude	0.0~100.0%	0.0~100.0	0.0%
P8.13	Jitter frequency	0.0~50.0%	0.0~50.0	0.0%
P8.14	Rise time of traverse	0.1~3600.0s	0.1~3600.0	5.0s
P8.15	Fall time of traverse	0.1~3600.0s	0.1~3600.0	5.0s

Traverse operation is widely used in textile and chemical fiber industry. The typical application is shown in following figure.

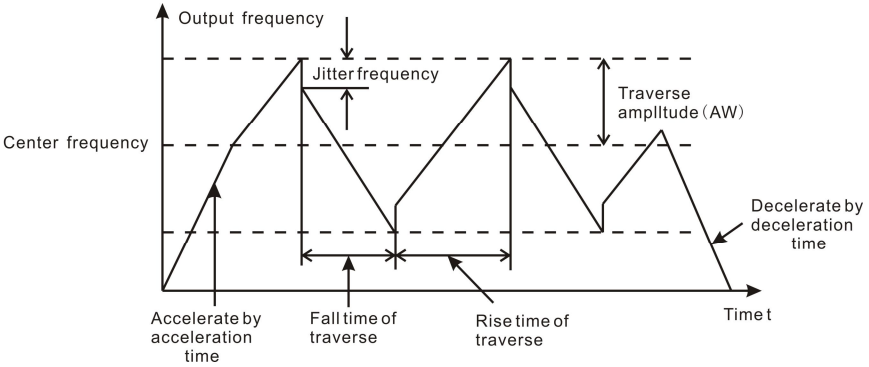


Figure 6-18 Traverse operation diagram.

Center frequency (CF) is reference frequency.

Traverse amplitude (AW) =center frequency (CF) * P8.12

Jitter frequency = traverse amplitude (AW) * P8.13

Rise time of traverse: Indicates the time rising from the lowest traverse frequency to the highest traverse frequency.

Fall time of traverse: Indicates the time falling from the highest traverse frequency to the lowest traverse frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P8.16	Auto reset times	0~3	0~3	0
P8.17	Fault relay action	0: Disabled 1: Enabled	0~1	0
P8.18	Reset interval	0.1~100.0s	0.1~100.0	1.0s

Auto reset function can reset the fault in preset times and interval. When P8.16 is set to be 0, it means “auto reset” is disabled and the protective device will be activated in case of fault.

P8.17 defines if fault relay active or not during auto reset. If continuous production without interruption is needed, please set P8.17=0.

Note:

- **The fault such as OUT 1, OUT 2, OUT 3, OH1 and OH2 cannot be reset automatically.**
- **If fault has not occurred for ten minutes after the fault is reset, inverter will automatically clear the previous times of auto reset.**

Function Code	Name	Description	Setting Range	Factory Setting

Function Code	Name	Description	Setting Range	Factory Setting
P8.19	Preset length	1~65535	1~65535	1000
P8.20	Actual length	0~65535	0~65535	0
P8.21	Number of pulse per cycle	0.1~6553.5	0.1~6553.5	100.0

These parameters are mainly used for fixed-length control.

The length is calculated by input pulse signal. If input pulse frequency is high, it is required to use HDI1 or HDI2 input (P5.35 or P5.36 = 2)

Actual length (P8.20) = Accumulated input pulse number / Number of pulse per cycle (P8.21).

When the value of P8.20 exceeds the value of P8.19, if multifunctional output terminal is set to be 11 (Length reached), ON signal will be output.

Function Code	Name	Description	Setting Range	Factory Setting
P8.22	Preset count value	1~65535	1~65535	1000
P8.23	Specified count value	1~65535	1~65535	1000

The count pulse input channel can be S1~S5 (≤200Hz) and HDI.

If function of output terminal is set as preset count reached, when the count value reaches preset count value (P8.22), it will output an ON-OFF signal. Inverter will clear the counter and restart counting.

If function of output terminal is set as specified count reached, when the count value reaches specified count value (P8.23), it will output an ON-OFF signal until the count value reaches preset count value (P8.22). Inverter will clear the counter and restart counting.

Note:

- **Specified count value (P8.23) should not be greater than preset count value (P8.22).**
- **Output terminal can be RO1, RO2 or HDO.**

This function is shown as following figure.

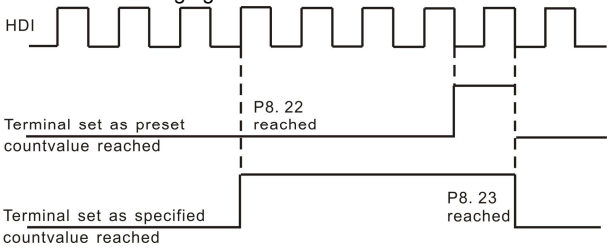


Figure 6-19 Timing chart for preset and specified count reached.

Function Code	Name	Description	Setting Range	Factory Setting
P8.24	Preset running time	0~65535h	0~65535	65535 h

If function of output terminal is set as running time reached, when the accumulated running time reaches the preset running time, it will output an ON-OFF signal.

Function Code	Name	Description	Setting Range	Factory Setting
P8.25	FDT level	0.00~ P0.07	0.00~ P0.07	50.00Hz
P8.26	FDT lag	0.0~100.0%	0.0~100.0	5.0%

When the output frequency reaches a certain preset frequency (FDT level), output terminal will output an ON-OFF signal until output frequency drops below a certain frequency of FDT level (FDT level - FDT lag), as shown in following figure.

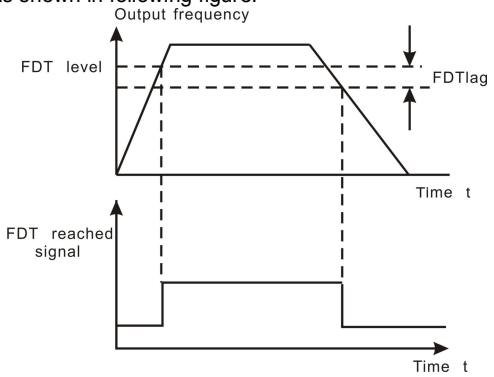


Figure 6-20 FDT Level diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.27	Frequency arrive detecting range	0.0~100.0% (maximum frequency)	0.0~100.0	0.0%

When output frequency is within the detecting range of reference frequency, an ON-OFF signal will be output.

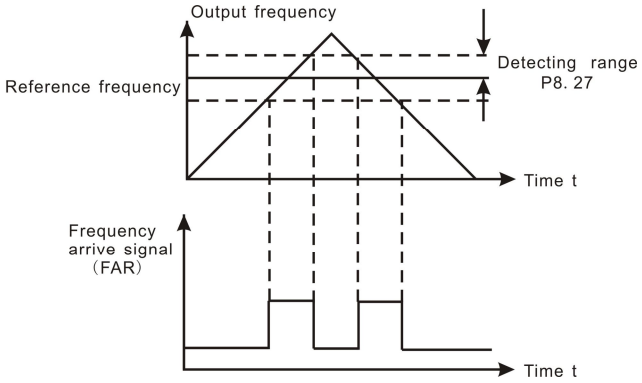


Figure 6-21 Frequency arriving detection diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.28	Droop control	0.00~10.00Hz	0.00~10.00	0.00Hz

When several motors drive the same load, each motor's load is different because of the difference of motor's rated speed. The load of different motors can be balanced through droop control function which makes the speed droop along with load increasing.

When the motor outputs rated torque, actual frequency drop is equal to P8.28. User can adjust this parameter from small to big gradually during commissioning. The relation between load and output frequency is in the following figure.

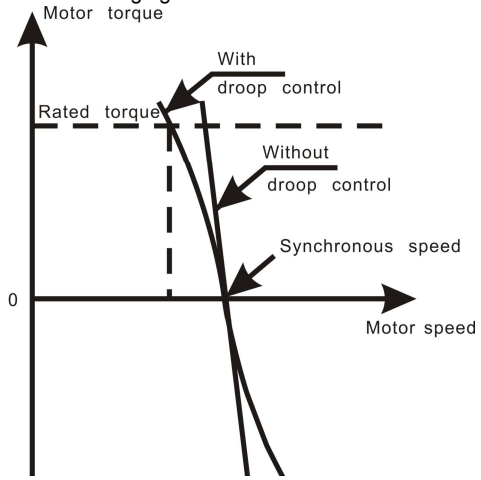


Figure 6-22 Droop control diagram

Function Code	Name	Description	Setting Range	Factory Setting

Function Code	Name	Description	Setting Range	Factory Setting
P8.29	Auxiliary motor selection	0: Invalid 1: Motor 1 valid 2: Motor 2 valid 3: Both valid	0~3	0
P8.30	Auxiliary motor1 START/STOP delay time	0.0~3600.0s	0.0~3600.0	5.0s
P8.31	Auxiliary motor2 START/STOP delay time	0.0~3600.0s	0.0~3600.0	5.0s

Above parameters are used to realize simple water supply control function which one inverter drives three pumps (one variable-frequency pump and two power-frequency pumps). The control logic is shown in the following figure.

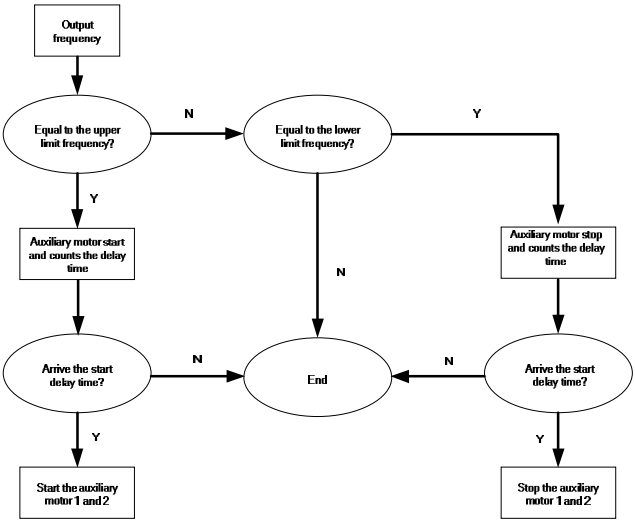


Figure 6-23 Simple water-supply function logical diagram.

Note:

- **Delay time of start auxiliary motor and stop auxiliary motor are the same.**
- **PID control (P0.03=6) is necessary for simple water supply control.**
- **P1.14 should not be set to be 1.**

Function Code	Name	Description	Setting Range	Factory Setting
P8.32	Brake threshold voltage	320.0~750.0V	320.0~750.0	700.0V

When the DC bus voltage is greater than the value of P8.32, the inverter will start dynamic braking.

Notice:

- **Factory setting is 380V if rated voltage of inverter is 220V.**
- **Factory setting is 700V if rated voltage of inverter is 380V.**
- **The value of P8.32 is corresponding to the DC bus voltage at rated input voltage.**

Function Code	Name	Description	Setting Range	Factory Setting
P8.33	Low-frequency threshold of restraining oscillation	0~10	0~10	2
P8.34	High-frequency threshold of restraining oscillation	0~10	0~10	0

The smaller the value of P8.33 and P8.34, the stronger the restraining effect.

Note: Most motor may have current oscillation at some frequency point. Please be cautious to adjust these parameters to weaken oscillation.

Function Code	Name	Description	Setting Range	Factory Setting
P8.35	Reserved	Reserved		
P8.36	Reserved	Reserved		

6.10 P9 Group --PID Control

PID control is a common used method in process control, such as flow, pressure and temperature control. The principle is firstly detect the bias between preset value and feedback value, then calculate output frequency of inverter according to proportional gain, integral and differential time. Please refer to following figure.

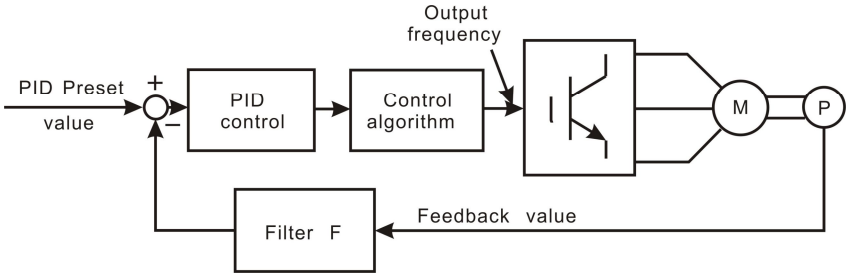


Figure 6-24 PID control diagram.

Note: To make PID take effect, P0.03 must be set to be 6.

Function Code	Name	Description	Setting Range	Factory Setting
P9.00	PID preset source selection	0: Keypad 1: AI1 2: AI2 3: HDI1 4: Simple PLC 5:485 communication 6: Profibus communication 7: CAN communication	0~7	0
P9.01	Keypad PID preset	-100.0%~100.0%	-100.0~100.0	0.0%
P9.02	PID feedback source selection	0: AI1 1: AI2 2: AI1-AI2 3: HDI1 4: 485 communication 5: Profibus communication 6: CAN communication	0~9	0

These parameters are used to select PID preset and feedback source.

Note:

- **Preset value and feedback value of PID are percentage value.**
- **100% of preset value is corresponding to 100% of feedback value.**
- **Preset source and feedback source must not be same, otherwise PID will be malfunction.**

Function Code	Name	Description	Setting Range	Factory Setting
P9.03	PID output characteristics	0: Positive 1: Negative	0~1	0

0: Positive. When the feedback value is greater than the preset value, output frequency will be decreased, such as tension control in winding application.

1: Negative. When the feedback value is greater than the preset value, output frequency will be increased, such as tension control in unwinding application.

Function Code	Name	Description	Setting Range	Factory Setting
P9.04	Proportional gain (Kp)	0.00~100.00	0.00~100.00	0.10
P9.05	Integral time (Ti)	0.01~10.00s	0.01~10.00	0.10s
P9.06	Differential time (Td)	0.00~10.00s	0.00~10.00	0.00s

Optimize the responsiveness by adjusting these parameters while driving an actual load.

Adjusting PID control:

Use the following procedure to activate PID control and then adjust it while monitoring the response.

1. Enabled PID control (P0.03=6)
2. Increase the proportional gain (Kp) as far as possible without creating oscillation.
1. Reduce the integral time (Ti) as far as possible without creating oscillation.
2. Increase the differential time (Td) as far as possible without creating oscillation.

Making fine adjustments:

First set the individual PID control constants, and then make fine adjustments.

- Reducing overshooting

If overshooting occurs, shorten the differential time and lengthen the integral time.

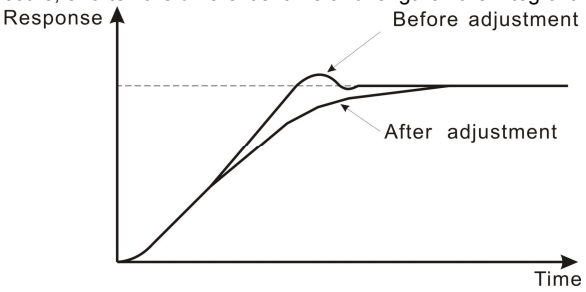


Figure 6-25 Reducing overshooting diagram.

- Rapidly stabilizing control state

To rapidly stabilize the control conditions even when overshooting occurs, shorten the integral time and lengthen the differential time.

- Reducing long-cycle oscillation

If oscillation occurs with a longer cycle than the integral time setting, it means that integral operation is strong. The oscillation will be reduced as the integral time is lengthened.

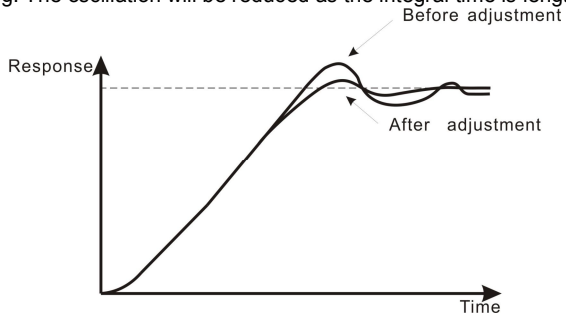


Figure 6-26 Reducing long-cycle oscillation diagram.

- Reducing short-cycle oscillation

If the oscillation cycle is short and oscillation occurs with a cycle approximately the same as the differential time setting, it means that the differential operation is strong. The oscillation will be reduced as the differential time is shortened.

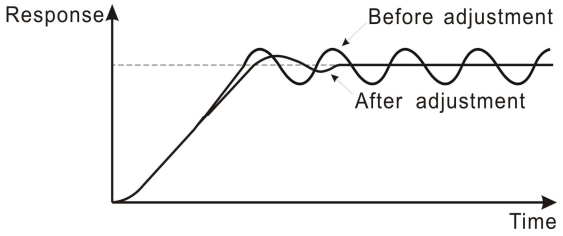


Figure 6-27 Reducing short-cycle oscillation diagram.

If oscillation cannot be reduced even by setting the differential time to 0, then either lower the proportional gain or raise the PID primary delay time constant.

Function Code	Name	Description	Setting Range	Factory Setting
P9.07	Sampling cycle (T)	0.01~100.00s	0.01~100.00	0.50s
P9.08	Bias limit	0.0~100.0%	0.0~100.0	0.0%

Sampling cycle T refers to the sampling cycle of feedback value. The PI regulator calculates once in each sampling cycle. The bigger the sampling cycle, the slower the response is.

Bias limit defines the maximum bias between the feedback and the preset. PID stops operation

when the bias is within this range. Setting this parameter correctly is helpful to improve the system output accuracy and stability.

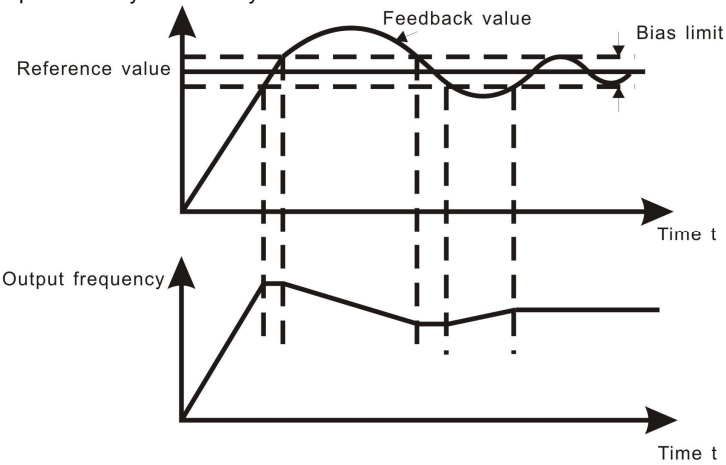


Figure 6-28 Relationship between bias limit and output frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P9.09	PID output filter time	0.00~10.00s	0.00~10.00	0.00

The bigger the filter time, the better the immunity capability, but the response becomes slow, vice versa.

Function Code	Name	Description	Setting Range	Factory Setting
P9.10	Feedback lost detecting value	0.0~100.0%	0.0~100.0	0.0%
P9.11	Feedback lost detecting time	0.0~3600.0s	0.0~3600.0	1.0s

When feedback value is less than P9.10 continuously for the period determined by P9.11, the inverter will alarm feedback lost failure (PIDE).

Note: 100% of P9.10 is the same as 100% of P9.01.

Function Code	Name	Description	Setting Range	Factory Setting
P9.12	Reserved	Reserved		
P9.13	Reserved	Reserved		

6.11 PA Group --Simple PLC and Multi-step Speed Control

Simple PLC function can enable the inverter change its output frequency and directions automatically according to preset running time. For multi-step speed function, the output frequency can be changed only by multi-step terminals.

Note:

- **Simple PLC has 16 steps which can be selected.**

Function Code	Name	Description	Setting Range	Factory Setting
PA.00	Simple PLC mode	0: Stop after one cycle 1: Hold last frequency after one cycle 2: Circular run	0~2	0

0: Stop after one cycle: Inverter stops automatically as soon as it completes one cycle, and it is needed to give run command to start again.

1: Hold last frequency after one cycle: Inverter holds frequency and direction of last step after one cycle.

2: Circular run: Inverter continues to run cycle by cycle until receive a stop command.

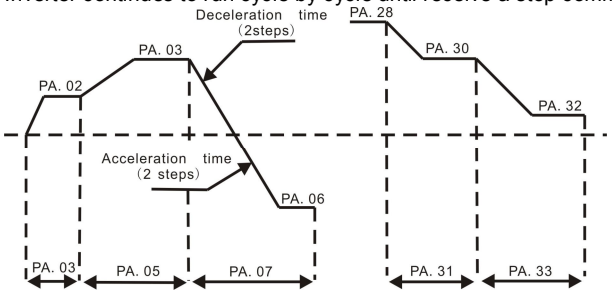


Figure 6-29 Simple PLC operation diagram.

Function Code	Name	Description	Setting Range	Factory Setting
PA.01	Simple PLC state saving selection	0: Not saved 1: Saved 2: Not saved when power off, saved when stop	0~2	0

This parameter determines whether the running step and output frequency of simple PLC should be saved. If PA.01 is set to be 2, running step and output frequency will be saved when inverter stops, but will not be saved when inverter is power off.

Function Code	Name	Description	Setting Range	Factory Setting
PA.02	Multi-step speed 0	-100.0~100.0%	-100.0~100.0	0.0%
PA.03	0th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.04	Multi-step speed 1	-100.0~100.0%	-100.0~100.0	0.0%
PA.05	1st Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.06	Multi-step speed 2	-100.0~100.0%	-100.0~100.0	0.0%
PA.07	2nd Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.08	Multi-step speed 3	-100.0~100.0%	-100.0~100.0	0.0%
PA.09	3rd Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.10	Multi-step speed 4	-100.0~100.0%	-100.0~100.0	0.0%
PA.11	4th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.12	Multi-step speed 5	-100.0~100.0%	-100.0~100.0	0.0%
PA.13	5th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.14	Multi-step speed 6	-100.0~100.0%	-100.0~100.0	0.0%
PA.15	6th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.16	Multi-step speed 7	-100.0~100.0%	-100.0~100.0	0.0%
PA.17	7th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.18	Multi-step speed 8	-100.0~100.0%	-100.0~100.0	0.0%
PA.19	8th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.20	Multi-step speed 9	-100.0~100.0%	-100.0~100.0	0.0%
PA.21	9th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.22	Multi-step speed 10	-100.0~100.0%	-100.0~100.0	0.0%
PA.23	10th Step running	0.0~6553.5s(h)	0.0~6553.5	0.0s

Function Code	Name	Description	Setting Range	Factory Setting
	time			
PA.24	Multi-step speed 11	-100.0~100.0%	-100.0~100.0	0.0%
PA.25	11th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.26	Multi-step speed 12	-100.0~100.0%	-100.0~100.0	0.0%
PA.27	12th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.28	Multi-step speed 13	-100.0~100.0%	-100.0~100.0	0.0%
PA.29	13th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.30	Multi-step speed 14	-100.0~100.0%	-100.0~100.0	0.0%
PA.31	14th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.32	Multi-step speed 15	-100.0~100.0%	-100.0~100.0	0.0%
PA.33	15th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s

Note:

- **100% of multi-step speed x corresponds to the maximum frequency (P0.07).**
- **If the value of multi-step speed x is negative, the direction of this step will be reverse, otherwise it will be forward.**
- **The unit of x step running time is determined by PA.36.**

Selection of step is determined by combination of multi-step terminals. Please refer to following figure and table.

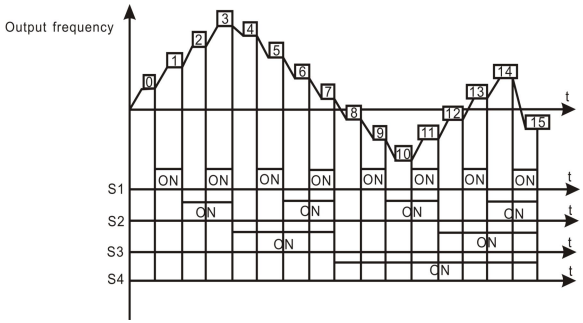


Figure 6-30 Multi-steps speed operation diagram.

Terminal / Step	Multi-step speed reference1	Multi-step speed reference2	Multi-step speed reference3	Multi-step speed reference4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Function Code	Name	Description	Setting Range	Factory Setting
PA.34	ACC/DEC time selection for step 0~7	0~65535	0~65535	0
PA.35	ACC/DEC time selection for step 8~15	0~65535	0~65535	0

These parameters are used to determine the ACC/DEC time from one step to next step. There are four ACC/DEC time groups.

Function Code	Binary Digit		Step No.	ACC/DEC Time 0	ACC/DEC Time 1	ACC/DEC Time 2	ACC/DEC Time 3
PA.34	BIT1	BIT0	0	00	01	10	11
	BIT3	BIT2	1	00	01	10	11

Function Code	Binary Digit		Step No.	ACC/DEC Time 0	ACC/DEC Time 1	ACC/DEC Time 2	ACC/DEC Time 3
	BIT5	BIT4	2	00	01	10	11
	BIT7	BIT6	3	00	01	10	11
	BIT9	BIT8	4	00	01	10	11
	BIT11	BIT10	5	00	01	10	11
	BIT3	BIT12	6	00	01	10	11
	BIT15	BIT14	7	00	01	10	11
PA.35	BIT1	BIT0	8	00	01	10	11
	BIT3	BIT2	9	00	01	10	11
	BIT5	BIT4	10	00	01	10	11
	BIT7	BIT6	11	00	01	10	11
	BIT9	BIT8	12	00	01	10	11
	BIT11	BIT10	13	00	01	10	11
	BIT3	BIT12	14	00	01	10	11
	BIT15	BIT14	15	00	01	10	11

For example: To set the acceleration time of following table:

Step No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ACC/DEC time group	0	1	2	3	2	1	3	0	3	3	2	0	0	0	2	2

The value of every bit of PA.34 and PA.35 is:

Low byte	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
PA.34	0	0	1	0	0	1	1	1
PA.35	1	1	1	1	0	1	0	0
High byte	BIT 8	BIT 9	BIT 10	BIT 11	BIT 12	BIT 13	BIT 14	BIT 15
PA.34	0	1	1	0	1	1	0	0
PA.35	0	0	0	0	0	1	0	1

So the value of PA.34 should be: 0X36E4, the value of PA.35 should be: 0XA02F.

Function Code	Name	Description	Setting Range	Factory Setting
PA.36	Time unit	0: Second 1: Hour	0~1	0

This parameter determines the unit of x step running time.

6.12 Pb Group -- Protection Parameters

Function Code	Name	Description	Setting Range	Factory Setting
Pb.00	Input phase-failure protection	0: Disabled 1: Enabled	0~1	1
Pb.01	Output phase-failure protection	0: Disabled 1: Enabled	0~1	1

Note:

- **Please be cautious to set these parameters as disabled. Otherwise it may cause inverter and motor overheat even damaged.**
- **The inverters below 7.5kW don't have phase-failure protection.**

Function Code	Name	Description	Setting Range	Factory Setting
Pb.02	Motor overload protection	0: Disabled 1: Normal motor 2: Variable frequency motor	0~2	2

1: For normal motor, the lower the speed, the poorer the cooling effect. Based on this reason, if output frequency is lower than 30Hz, inverter will reduce the motor overload protection threshold to prevent normal motor from overheat.

2: As the cooling effect of variable frequency motor has nothing to do with running speed, it is not required to adjust the motor overload protection threshold.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.03	Motor overload protection current	20.0%~120.0%	20.0~120.0	100.0%

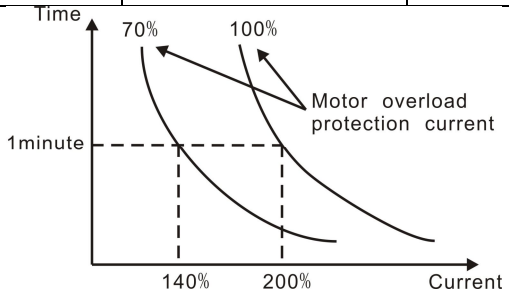


Figure 6-31 Motor overload protection curve.

The value can be determined by the following formula:

Motor overload protection current = (motor rated current / inverter rated current) * 100%

Note:

- **This parameter is normally used when rated power of inverter is greater than rated power of motor.**
- **Motor overload protection time: 60s with 200% of rated current. For details, please refer to above figure.**

Function Code	Name	Description	Setting Range	Factory Setting
Pb.04	Overload pre-warning threshold	20.0%~150.0%	20.0~150.0	130.0%
Pb.05	Overload pre-warning selection	0: Always detect relative to motor rated current 1: Detect while constant speed relative to motor rated current 2: Always detect relative to inverter rated current 3: Detect while constant speed relative to inverter rated current	0~3	0
Pb.06	Overload pre-warning delay time	0.0~30.0s	0.0~30.0	5.0s

The value of Pb.05 determines the pre-warning category, such as motor overload (OL1) or inverter overload (OL2).

Pb.04 determines the current threshold of pre-warning actionn, it is a percentage of the rated current. When output current of inverter exceeds the value of Pb.04 and last the duration determined by Pb.06, inverter will output a pre-warning signal. Please refer to following diagram:

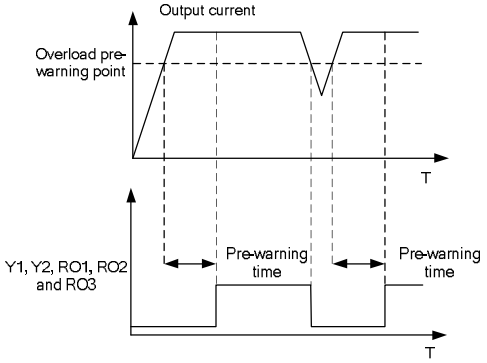


Figure 6-32 Overload pre-warning schematic diagram.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.07	Threshold of trip-free	230.0V~600.0V	230.0~600.0	450.0V
Pb.08	Decrease rate of trip-free	0.00Hz~P0.07	0.00Hz~P0.07	0.00Hz

If Pb.08 is set to be 0, the trip-free function is invalid.

Trip-free function enables the inverter to perform low-voltage compensation when DC bus voltage drops below Pb.07. The inverter can continue to run without tripping by reducing its output frequency and feedback energy via motor.

Note: If Pb.08 is too big, the feedback energy of motor will be too large and may cause over-voltage fault. If Pb.08 is too small, the feedback energy of motor will be too small to achieve voltage compensation effect. So please set Pb.08 according to load inertia and the actual load.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.09	Over-voltage stall protection	0: Disabled 1: Enabled	0~1	0
Pb.10	Over-voltage stall protection point	110~150%	110~150	125%

During deceleration, the motor's decelerating rate may be lower than that of inverter's output frequency due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in DC bus voltage rise. If no measures taken, the inverter will trip due to over voltage.

During deceleration, the inverter detects DC bus voltage and compares it with over-voltage stall

protection point. If DC bus voltage exceeds Pb.10, the inverter will stop reducing its output frequency. When DC bus voltage become lower than Pb.10, the deceleration continues, as shown in following figure.

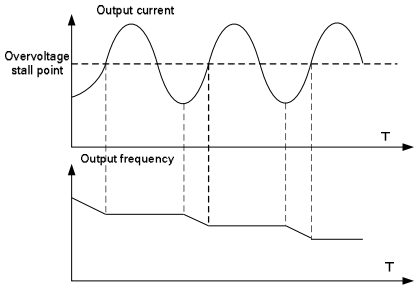


Figure 6-33 Over-voltage stall function.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.11	Over-current protection	0: Disabled 1: Enabled	0~1	1
Pb.12	Over-current stall threshold	50~200%	50~200	160%
Pb.13	Frequency decrease rate	0.00~50.00Hz/s	0.00~50.00	1.00Hz/s

During acceleration of inverter, the actual motor speed rise rate may lower than the output frequency rise rate because of too big load. If no measures to take, inverter will trip caused by over-current.

The principle of over-current protection is to detect the output current of inverter during inverter operation and compare it with over-current stall threshold determined by Pb.12. If it exceeds the value of Pb.12 during acceleration, inverter will remain output frequency; if it exceeds the value of Pb.12 during constant speed running, inverter will decrease output frequency. When output current of inverter is lower than the value of Pb.12, inverter will continue to accelerate until output frequency reach frequency reference. Please refer to following diagram.

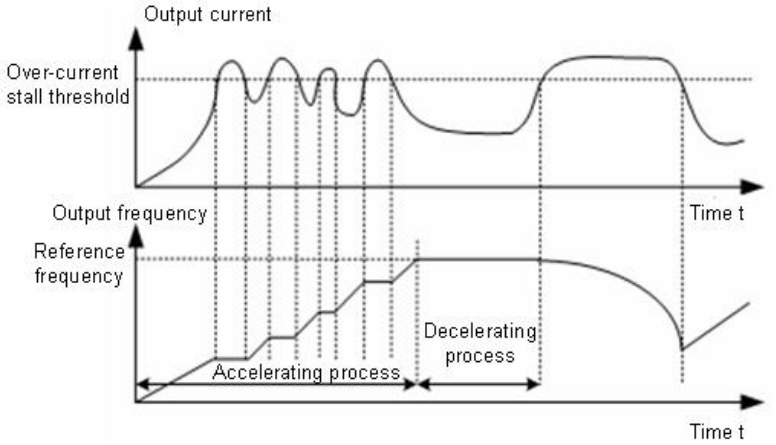


Figure 6-34 Over-current stall functions.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.14	Speed deviation protection	0.1~50.0%	0.1~50.0	20.0%
Pb.15	Speed deviation time	0.000~10.000	0.000~10.000	0.500s

Function Code	Name	Description	Setting Range	Factory Setting
Pb.16	Motor overtemperature protection	0:Disabled 1:Enabled	0~1	0

Function Code	Name	Description	Setting Range	Factory Setting
Pb.17	Temperature adjustment bias	-80.0~80.0	-80.0~80.0	0.0℃
Pb.18	Temperature correction factor	50.0~150.0	50.0~150.0	100.0%

Note: it is necessary to select corresponding I/O card when using this function.

Function Code	Name	Description	Setting Range	Factory Setting

Function Code	Name	Description	Setting Range	Factory Setting
Pb.19	Motor overtemperature protection point	0~150.0℃	0~150.0	120.0℃

If the motro temperature exceeds P9.14, the inverter will stop and report OH3 and the fault will be displayed on the LCD.

6.13 PC Group --Serial Communication

Function Code	Name	Description	Setting Range	Factory Setting
PC.00	Local communication address		0~247	1

During the master is writing frames, if the communication address of the slave is set to 0, all salves on Modbusbus will receive the frame, but the slave will not answer. Note: the slave address can not be set to 0.

Local communication address is unique in the communication, which is the basis of point to point communication between the upper monitor and the inverter.

Function Code	Name	Description	Setting Range	Factory Setting
PC.01	Communication baudrate selection	1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	0~5	4

This parameter is used to set the transmission speed between the upper monitor and the inverter. Note: the baud rate of the upper monitor and the inverter should be the same; otherwise, the communication is not available. The larger the baud rate, the quicker the speed.

Function Code	Name	Description	Setting Range	Factory Setting
PC.02	Data bit checkout setting	0: No checkout (8, N, 2) for RTU 1: Even checkout (8, E, 1) for RTU 2: Odd checkout (8, O, 1) for	0~8	1

Function Code	Name	Description	Setting Range	Factory Setting
		RTU 3: No checkout (8, N, 2) for ASCII 4: Even checkout (8, E, 1) for ASCII 5: Odd checkout (8, O, 1) for ASCII 6: No checkout (7, N, 2) for ASCII 7: Even checkout (7, E, 1) for ASCII 8: Odd checkout (7, O, 1) for ASCII		

The data format of the upper monitor and the inverter should be the same, otherwise,the communication is not available.

Function Code	Name	Description	Setting Range	Factory Setting
PC.03	Communication answer delay		0~200	5

Answer delay: the interval time between the data receiving of the inverter and data sending to the upper monitor. If the answer delay is shorter than the system time, then it is subject to the system time, and if the answer delay is longer than the system, then the waitimg time should be prolonged after the data processing to achieve the answer delay and then to send data to the upper monitor.

Function Code	Name	Description	Setting Range	Factory Setting
PC.04	Fault time of communication overtime		0.0~100.0	0.0

If the function code is set to 0.0s, this parameter is invalid.

If the function code is set to a valid value, when the interval time exceeds the communication overtime, the system will report communication fault (CE).

Generally, the parameter is set to invalid. If the parameter is set in a continuous communication

system, the communication state can be monitored.

Function Code	Name	Description	Setting Range	Factory Setting
PC.05	Transmission fault processing	0: Communication answer enabling 1: Communication answer closing	0~1	0

In the communication mode, this parameter is used to select whether the slave answer the message from the master.

Function Code	Name	Description	Setting Range	Factory Setting
PC.06	Transmission response processing	0: Alarm and coast to stop 1: Do not alarm and keep running 2: Do not alarm and stop at the stopinh method (only for communication control mode) 3: Do not alarm and stop at the stopinh method (only for all control modes)	0~3	0

In the abnormal situation, the inverter can act through setting communication fault processing. The selected running state of the inverter is: shield the CE fault, stop or keep running.

Function Code	Name	Description	Setting Range	Factory Setting
PC.07	Reserved			

Selecting 485 communication protocols, the standard modbus protocol should be set to 0, master-slave control protocol should be set to 1, or communication can not work.

Function Code	Name	Description	Setting Range	Factory Setting
PC.08	Ethernet communication speed setting	0: 10 M full-duplex 1: 10 M half-duplex 2: 100 M full-duplex 3: 100 M half-duplex 4: Adaptive	0~4	0

The function code is used for the Ethernet communication speed settings.

Function Code	Name	Description	Setting Range	Factory Setting
PC.09	IP Address 1	0~255	0~255	192
PC.10	IP Address 2	0~255	0~255	168
PC.11	IP Address 3	0~255	0~255	0
PC.12	IP Address 4	0~255	0~255	1
PC.13	Subnet Mask 1	0~255	0~255	255
PC.14	Subnet Mask 2	0~255	0~255	255
PC.15	Subnet Mask 3	0~255	0~255	255
PC.16	Subnet Mask 4	0~255	0~255	0

This section is used to set the Ethernet IP address and subnet mask of communications.

IP Address format: PC.09, PC.10, PC.11, PC.12

For example: IP address is 192.168.0.1

IP Subnet Mask Format: PC.13. PC.14. PC.15. PC.16

For example: subnet mask is 255.255.255.0.

Function Code	Name	Description	Setting Range	Factory Setting
PC.17~PC.21	Reserved	0~65535	0~65535	0

This function is reserved.

Function Code	Name	Description	Setting Range	Factory Setting
PC.22	CAN Address	0~127	0~127	1

Set CAN Bus mailing address. Local address in the CAN bus communication network, is unique.

Function Code	Name	Description	Setting Range	Factory Setting
PC.23	CAN baud rate settings	0：100K BPS 1：125K BPS 2：250K BPS 3：500K BPS 4：1M BPS	0~4	3

This parameter is used to set up the data transfer rate of CAN-bus between the two inverters.

Function Code	Name	Description	Setting Range	Factory Setting

Function Code	Name	Description	Setting Range	Factory Setting
PC.24	CAN communication timeout delay	0.0~100.0s	0.0~100.0	0s

When the function code is set to be 0.0s, PA.24 is invalid.

When the function code is set to be non-zero value, if the time between this communication and the next exceeds the communication timeout interval, the system will report communication fault (CANE). Usually this parameter is set to invalid. You can monitor the communication status by this parameter in continuous communication systems.

Function Code	Name	Description	Setting Range	Factory Setting
PC.25	Reserved			
PC.26	Reserved			
PC.27	Reserved			
PC.28	Reserved			
PC.29	Reserved			

6.14 Pd Group--Profibus communication

For more information, please refer to Profibus communication enable manual.

Function Code	Name	Description	Setting Range	Factory Setting
Pd.00	Module type	1:Profibus	1	Profibus
Pd.01	Module address	0~99	0~99	2
Pd.02	PZD2 receiving	0: Invalid 1: Speed reference 2: Traction reference 3: Upper limit current reference 4: The starting pre-torque compensation value 5: Torque upper limit frequency 6: Master-slave mode	0~20	1
Pd.03	PZD3 receiving		0~20	2
Pd.04	PZD4 receiving		0~20	3
Pd.05	PZD5 receiving		0~20	0
Pd.06	PZD6 receiving		0~20	0
Pd.07	PZD7 receiving		0~20	0
Pd.08	PZD8 receiving		0~20	0
Pd.09	PZD9 receiving		0~20	0
Pd.10	PZD10 receiving		0~20	0
Pd.11	PZD11 receiving		0~20	0

Function Code	Name	Description	Setting Range	Factory Setting
Pd.12	PZD12 receiving	selection 7：Motor temperature given 8~20: Reserved	0~20	0
Pd.13	PZD2 sending	0: Invalid 1: Running frequency 2: Reference speed rpm 3: DC bus voltage 4: Output voltage 5: Output current 6: Output torque pecentage 7: Output power pecentage 8: Frequncy reference 9: Function code 10: Reserved 11: PG card position 12: Input terminal status 13: Output terminal status 14: Torque compensation 15: Motor rated torque 16: Reference frequency of the slope 17:Pd.24 18~30: Reserved	0~30	9
Pd.14	PZD3 sending		0~30	10
Pd.15	PZD4 sending		0~30	11
Pd.16	PZD5 sending		0~30	6
Pd.17	PZD6 sending		0~30	7
Pd.18	PZD7 sending		0~30	5
Pd.19	PZD8 sending		0~30	0
Pd.20	PZD9 sending		0~30	0
Pd.21	PZD10 sending		0~30	0
Pd.22	PZD11 sending		0~30	0
Pd.23	PZD12 sending		0~30	0
Pd.24	Temporary variable of PZD sending	0~65535	0~65535	0
Pd.25	Time of Dp communication overtime fault	0.0~100s	0.0~100	0.0s
Pd.26~ Pd.29	Reserved			

PZD Data sending instruction:

No.	name	Description

<table>
<tr><th>No.</th><th>name</th><th>Description</th></tr>
<tr><td>1</td><td>Running frequency</td><td>Unit:Hz, Range: (-32767~32767),Example:5000=50.00Hz</td></tr>
<tr><td>2</td><td>Running speed</td><td>Unit:rpm, Range: (-32767~32767),Example:1000=1000 rpm</td></tr>
<tr><td>3</td><td>DC bus voltage</td><td>Unit:V,Range:(0~65535) Example:6000=600.0V</td></tr>
<tr><td>4</td><td>Ouput voltage</td><td>Drive voltage feedback,Unit:V,Range:(0~65535) Example: 380=380V</td></tr>
<tr><td>5</td><td>Output current</td><td>Drive current feedback,Unit:A,Range: (0~65535) Example:1500=150.0A</td></tr>
<tr><td>6</td><td>Output torque</td><td>Unit:%, Range: (-32767~32767) Example500=50.0%, 100.0% is corresponding to speed at rated torque</td></tr>
<tr><td>7</td><td>Output power</td><td>Unit:kW, Range: (-32767~32767) Example2000=200.0kW, 100.0% corresponding to motor rated power</td></tr>
<tr><td>8</td><td>Frequecy setting absolute value</td><td>Unit:Hz,Range:(-32767~32767), Example:5000=50.00Hz</td></tr>
<tr><td>9</td><td>Fault code</td><td>Range: (0~65535),Corresponding to the function code of (P7.21~P7.23)</td></tr>
<tr><td>10</td><td>Reserved</td><td>Range: (0~65535)</td></tr>
<tr><td>11</td><td>PG Card position</td><td>Range:(0~65535)</td></tr>
<tr><td>12</td><td>Input terminal state</td><td>Range:(0~65535) is the decimal of input terminal state(binary). Example: 43(decimal)= 00101011(binary), which means S1, S2, S4, S6 is on
<table>
<tr><td></td><td>BIT 8</td><td>BIT 7</td><td>BIT 6</td><td>BIT 5</td></tr>
<tr><td></td><td>HDI</td><td>S8</td><td>S7</td><td>S6</td></tr>
<tr><td>BIT 4</td><td>BIT 3</td><td>BIT 2</td><td>BIT 1</td><td>BIT 0</td></tr>
<tr><td>S5</td><td>S4</td><td>S3</td><td>S2</td><td>S1</td></tr>
</table></td></tr>
<tr><td>13</td><td>Output terminal state</td><td>Range: (0~65535) is the decimal of output terminal state (binary). Example: 11(decimal) = 1011(binary), which means RO3, RO3 and HDO is on.
<table>
<tr><td>BIT6</td><td>BIT5</td><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr>
<tr><td>RO6</td><td>RO5</td><td>RO4</td><td>RO3</td><td>RO2</td><td>RO1</td><td>HDO</td></tr>
</table></td></tr>
</table>

No.	name	Description
14	Torque compensation	Unit:%, Range:(-32767~32767), Example:500=50.0%; 100.0% is corresponding to rated torque at rated speed
15	Torque at rated speed	Unit: N.m, Range: (0~65535), Example: 2000=2000N.m
16	Slope frequency reference	Unit: Hz, Range: (-32767~32767), Example: 5000=50.00Hz

PZD Data receiving instruction:

No.	name	Description
1	Frequency reference	Unit: %, Range:(-10000~10000), Example: 5000=50.00%, 100.00% is corresponding to maximum frequency P0.03.
2	Torque reference	Unit: %, Range: (-10000~10000) Example: 5000=50.00%, 100.00% is corresponding to the torque with upper current limit.
3	Upper limit Current reference	Unit: %, Range:(0~2000), Example: 500=50.0%, 100.00% is corresponding to rated current.
4	Starting pretorque compensation value	Unit: %, Range:(-2000~2000), Example: 500=50.0%, 100.00% is corresponding to torque at rated speed’
5	Torque upper limit frequency reference	Unit: %, Range: (-10000~10000),Example: 5000=50.00%, 100.00% is corresponding to maximum frequency

6.15 PE Group--Factory setting

This group is the factory-set parameter group. It is prohibited for user to access.

7 Description of extension cards

7.1 Instructions of the Extension Card

The mdoel of I/O extension card is CHV190-I/O.

7.1.1 Description of I/O extension card terminal and jumper

(1) Terminals

Terminal	Description
S7~S10	ON-OFF signal input, optical coupling isolation input terminal with PW and COM. Input voltage range: 9~30V Input impedance: 3.3kΩ
COM	Common ground terminal for +24V or external power supply
GND	Common ground terminal of +10V
Y2	Open collector output terminal, the corresponding common ground output terminal is CME External voltage range:0~24V Output current range:0~50mA
CME2	Open collector output common terminal
AO2	Analog quantity output terminal Output range:0~10V/0~20mA(select voltage or current output by J2)
RO3A,RO3B,RO3C	Relay output:RO3A common,RO3B NC,RO3C NO Contact capacity:AC250V/3A,DC30V/1A
RS485+,RS485-	RS485 serial Communication
CANH,CANL	CAN communication interface(reserved)
PT100,GND	Motor temperature detection input, support PT100 and PT1000

Note: GND must be isolated from COM.

(2) Jumper

Jumper	Description
J1	Short-connect 1 and 2 as the CAN control output terminal and parallel a 120Ω matching resistance for CAN control output terminal, 2 and 3 are short-connected in the air.
J2	Switch between 0~10V voltage input or 0~20mA current input Short-connect 1 and 2 as the voltage input:

Jumper	Description
	Short-connect 2(GND) and 3(I)means as the current input.
S1	Selection of RS485 communication terminal organ setting. ON: enable terminal organ; OFF: terminal organ is forbidden. When the RS485 port is at the end of RS485 communication network cable, which needs to enable terminal organ.

7.1.2 Description of dimension and terminal compositor

(1) Dimension of I/O extension card and the schematic diagram

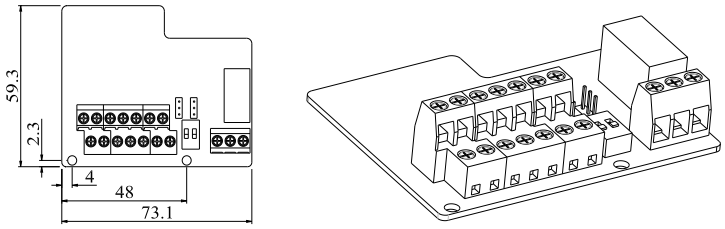
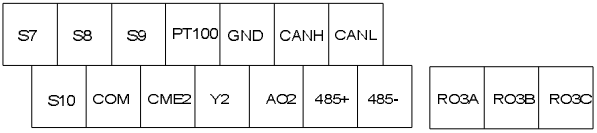


Figure 7-1 Dimension of I/O extension card and the schematic diagram

(2) The schematic diagram of terminal compositor



7.1.3 Installation of I/O extension card

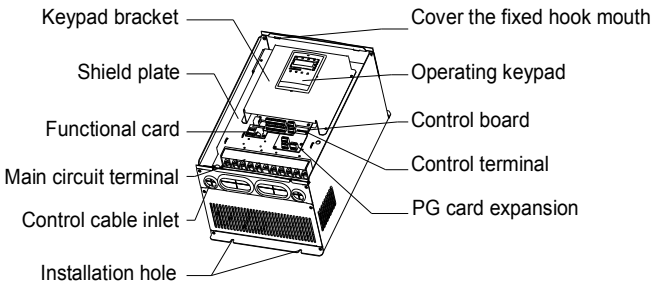


Figure 7-2 Installation of I/O extension card

7.2 Incremental encoder PG card

It is necessary to select PG card in PG vector control. The function of the PG card includes processing circuits for two channels of orthogonal coder signals, being capable of receiving signals from differential output, open-circuit collector output and push-pull output encoders,

coder power supply. In addition, it can output in frequency-division the inputted encoder signals (output are two channels of orthogonal signals). The user can select by J1 and J2 according to actual utilization.

7.2.1 Model and specifications

EC-PG 1 01 - 05

① ② ③ ④ ⑤

Serial No.	Instruction	Example
①	Product type	EC-extension card
②	Card type	PG: P/G card
③	Technical versions	Odds such as 1, 3 and 5 stands for the 1st, 2nd and 3rd generation.
④	Code	01: Incremental encoder PG card 02: Cosine encoder PG card 03: UVW encoder PG card 04: The resolver PG card
⑤	Power supply	05: 5V 12: 12-15V 24: 24V

7.2.2 Technical specifications

Model	EC-PG101-12	EC-PG101-24
Output power supply	Support 11.75V~16V output, the factory value is 12V±5%, Max. Output current is 350mA.	24V±5% output, Max. Output current is 300mA
Input signal	Support the differential open-collector push-pull encoder A, B, Z signal input, the response speed of 0 ~ 100kHz	Support the differential open-collector push-pull encoder A, B, Z signal input, the response speed of 0 ~ 100kHz
Output signal	Output frequency: 0~80kHz Output: Differential output, push-pull output, open collector output, frequency division output Range: 1~256 Output impedance :70Ω	Output frequency: 0~80kHz Output: Differential output, push-pull output, open collector output, frequency division output Range: 1~256 Output impedance :70Ω

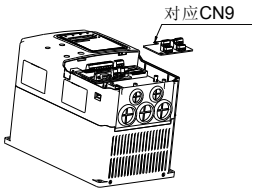


Figure 7-3 Installation of PG Card

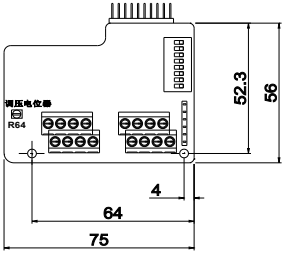


Figure 7-4 Dimensions of PG Card

NOTE: The contact pin of PG card in CN3 is valid when the incrementa encoder PG card is used on IPE200 machine.

7.2.3 Description of terminals and DIP Switch

There are 2 2*4P wiring terminal on the PG card.

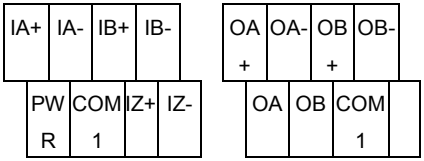


Figure 7-5 Wiring terminal

Of which, PWR and COM1 are working voltage output for the encoder; IA+, IA-, IB+, IB-, IZ+ and IZ- are signal input terminals for the encoder; OA+, OA-, OB+ and OB- are output terminals for frequency-division signals; OA, OB and COM1 are the output terminal of frequency–division push-pull signal and open collector signal; the user can grounded the PG by themselves.

The frequency division factor is determined by the DIP switch on the card. The DIP switch consists of 8 bits. When the binary digits are displayed by DIP switch pluses 1, the relative value is frequency division factor. The bit marked as “1” on the DIP switch is the lower binary bit, while “8” is the higher binary bit. When the DIP switch is switched to ON, the bit is valid, indicating “1”; otherwise, it indicates “0”.

Decimal digit	Binary digit	Frequency division factor
0	00000000	1
1	00000001	2
2	00000010	3

Decimal digit	Binary digit	Frequency division factor
…	…	…
m	…	m+1
255	11111111	256

7.2.4 Wiring diagram

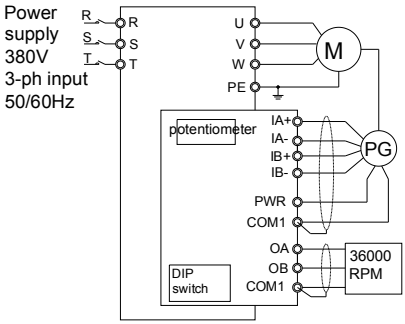


Figure 7-6 PG card wiring diagram

7.2.5 Wiring notes

1. The signal line of PG card should be separated from the power line. Parallel wiring is forbidden.
2. Select shielded cables as the signal lines of PG card to prevent coder signals from disturbance.
3. The shielding layer of shielded cable of PG card should be grounded (such as terminal PE of the inverter), and furthermore, only one end is grounded, to prevent signal from disturbance.
4. If the frequency-division output of PG card is connected to the user power supply, the voltage should be less than 24V; otherwise, the PG card may be damaged.

7.2.6 Application connection

7.2.6.1 Input application connection

① Wiring diagram of differential input encoder

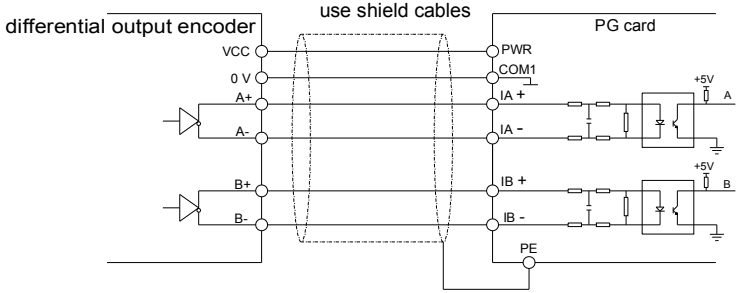


Figure 7-7 Wiring diagram of differential output encoder

②Wiring diagram of open collector input encoder

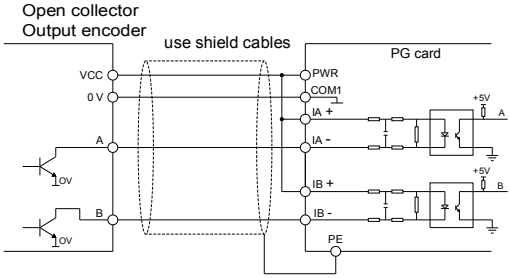


Figure 7-8 Wiring diagram of open collector output encoder

③Wiring Diagram of push-pull input encoder

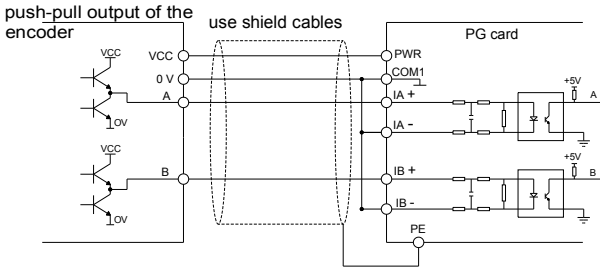


Figure 7-9 Wiring diagram of push-pull output encoder

7.2.6.2 Output application connection

①Wiring diagram of differential output encoder

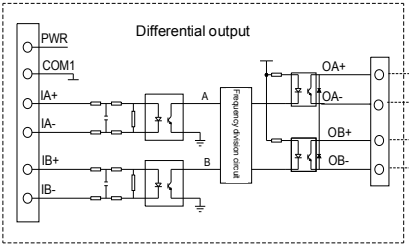


Figure 7-10 Wiring diagram of PG card frequency division output

②Wiring diagram of open collector output encoder

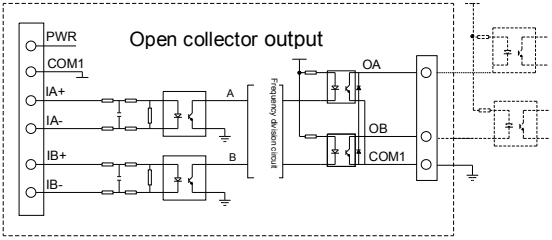


Figure 7-11 Wiring diagram of PG card frequency division open collector

③Wiring Diagram of push-pull output encoder

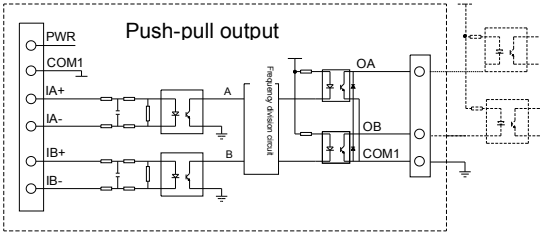


Figure 7-12 Wiring diagram of PG card frequency pull-push output

7.3 Cosine encoder PG card and UVW encoder PG card

7.3.1 Model and specifications

The technical features are as below:

Model	EC-PG102-05	EC-PG103-05
Frequency division factor	1 (No DIP switch)	1~256 (With DIP switch)
Output power	Voltage range: 4.75V~7V Factory setting: 5V/±5% Max. output current: 300mA	Voltage range: 4.75V~7V Factory setting: 5V/±5% Max. output current: 300mA
Output signal	Output: Two orthogonal frequency division differential output, open collector output Open collector output impedance: 70Ω	Output: Two orthogonal frequency division differential output, open collector output Open collector output impedance: 70Ω

The user can select the output voltage according to actual working, and in long-distance transimission, the power voltage can be adjusted through potentiometer to prolong the wiring distance.

7.3.2 Dimensions and installation of UVW encoder PG card

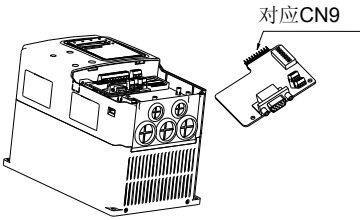


Figure 7-13 Installation of UVW encoder PG card

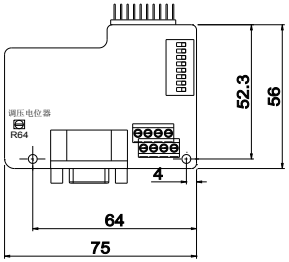
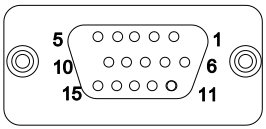


Figure 7-14 Dimensions of UVW encoder PG card

7.3.3 Description of terminals and DIP switch

There are 1 signal interface and 7 wiring terminals on UVW encoder PG card and cosine encoder PG card.



DB15

OA+	OA-	OB+	OB-
OA	OB	COM1	

Frequency division output interface

Figure 7-15 Interfaces and wiring terminal of PG card

OA+, OA-, OB+ and OB- are the signal frequency division output terminals. OA, OB and COM1 are open collector output terminals.

Note: The PE terminal of PG Card has not been connected to the earth; the user must connect the card to earth by themselves.

DB15 is the port of the encoder input signal. The order of the ports signal is as follow:

Ports	SIN/COS	UVW
5	A+	A+
6	A-	A-
8	B+	B+
1	B-	B-
3	R+	Z+

Ports	SIN/COS	UVW
4	R-	Z-
11	C+	U+
10	C-	U-
12	D+	V+
13	D-	V-
9	PWR	PWR
7	GND	GND
14	Null	W
15	Null	W-
2	Null	Null

During the application of above PG cards, insert the corresponding connecting wires of the signal arrangement of SIN/COS or UVW encoder and the synchronous PG card into DB15.

The frequency division factor of UVW encoder PG card is the same as that of the incremental encoder. Please refer to 7.2.3.

Note: ：

① SIN/COS or UVW encoder PG card are mainly used on the close loop vector control of SM.

② UVW encoder PG card can process the 5V incremental encoder signal and the wiring is the same as that of the incremental encoder. The main wiring ports are A, B, Z, PWR and GND on DB15.

7.4 Description of Modbus communication card

7.4.1 Model and specification

The model of CHV190's Modbus communication card is compatible with CHV's extension card. This card supports RS232 and RS485.

7.4.2 Dimension drawings and Installation

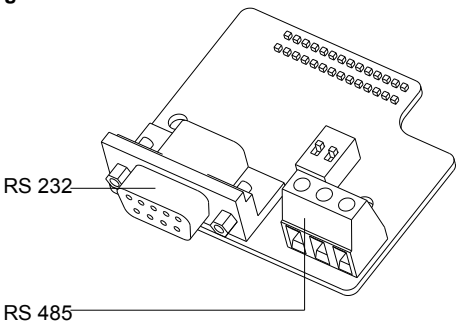


Figure 7-16 Modbus communication card

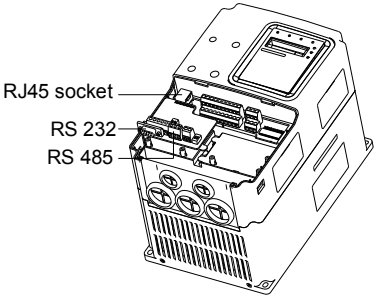


Figure 7-17 Installation of communication card

7.4.3 Application of Modbus communication card

When the communication between CHV 190 inverters and the upper PC (PLC, industrial PC) is needed, it is necessary to choose an external extension card with communication port. This communication card supports two modes: RS232 and RS485. The electrical parameters comply with relative international standards and can implement smooth communications between CHV inverter and upper PC system. The user can select corresponding channel according to actual application.

7.4.4 Terminals

The communication card has two groups of terminals, which is shown in Figure 7-18 and Figure 7-19.

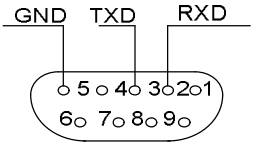


Figure 7-18 DB9: Bus-connector terminal

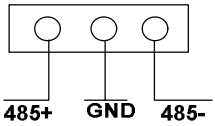


Figure 7-19 RS485 terminal

Note:

Run analog and digital signals in separate cables.

The relay cable needs the cable type with braided metallic screen.

The keypad needs to connect with cables. It is recommended to use the screen cable on complex electrical magnetic condition.

1. Please install this card when the inverter is completely powered off.
2. Please make sure the communication card and control board are well connected, and use screws to fix the communication card.
3. To prevent communication signals from external interference, please choose twisted pairs as communication cable, and try to avoid parallel wiring with the drive power.

4. It is recommended to select shielded cables for communication connection.

7.5 Description of Profibus communication card

7.5.1 Introduction

7.5.1.1 Profibus standard

(1) Profibus is an open international fieldbus standard that allows data exchange among various types of automation components. It is widely used in manufacturing automation, process automation and in other areas automation such as buildings, transportation, power, providing an effective solution for the realization of comprehensive automation and site-equipment intellectualization.

(2) Profibus is composed of three compatible components, Profibus-DP (Decentralized Periphery, distributed peripherals), Profibus-PA (Process Automation), Profibus-FMS (Fieldbus Message Specification, Fieldbus Message Specification). It is periodically exchange data with the inverter when using master-slave function. PRNV Profibus-DP adapter module only supports Profibus-DP protocol.

(3) The physical transmission medium of bus is twisted-pair (in line with RS-485 standard), two-wire cable or fiber optic cable. Baud rate is from 9.6Kbit/s to 12Mbit/s. The maximum bus cable length is between 100 m and 1200 m, specific length depending on the selected transmission rate (see the technical data chapter). Up to 31 nodes can be connected to the same Profibus network when repeaters aren't used. But, if use repeaters, up to 127 nodes can be connected to the same Profibus network segment (including repeaters and master stations).

(4) In the process of Profibus communication, token assign among masters and master-slave transmission among master-slave stations. Supporting single-master or multi-master system, stations-programmable logic controller(PLC)-choose nodes to respond to the master instruction. Cycle master-from user data transmission and non-cyclic master-master station can also send commands to multiple nodes in the form of broadcast. In this case, the nodes do not need to send feedback signals to the master. In the Profibus network, communication between nodes can not be allowed.

(5) Profibus protocol is described in detail in EN 50170 standard. To obtain more information about Profibus, please refer to the above-mentioned EN 50170 standard.

7.5.1.2 Product naming rules

Fieldbus adapter naming rules, the product model:

EC-TX 1 03

① ② ③ ④

Serial No.	Instruction	Details

①	Product type	EC: Extension card
②	Card type	TX: Communication card
③	Technical version	Use odds such as 1, 3, 5 and 7 to stand for the 1st, 2nd, 3rd and 4th generation product.
④	Difference	03: Profibus+Ethernet Communication card 04: Ethernet+CAN Communication card

7.5.1.3 EC-TX communication card

EC-TX communication card module is an optional device to inverter which makes inverter connected to Profibus network. In Profibus network, inverter is a subsidiary device. The following functions can be completed using EC-TX communication card module:

● Send control commands to inverter (start, stop, fault reset, etc.).

● Send speed or torque reference to inverter.

● Read out state and actual values of inverter.

● Modify the inverter parameter.

Please refer to the description of function codes in Group PD for the commands supported by the device. Below is the structure diagram of the connection between the device and Profibus：

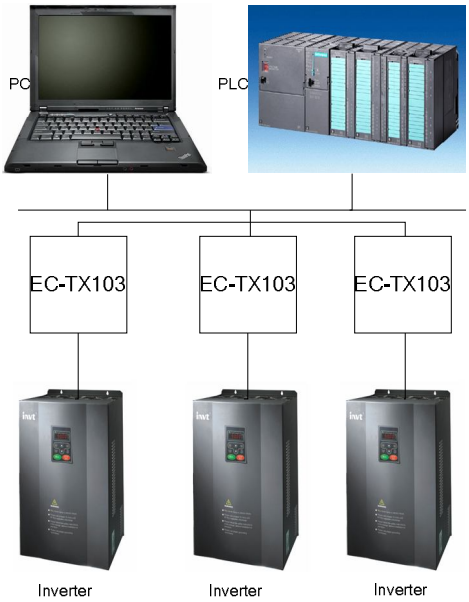


Figure 7-20 Profibus communication structure diagram

7.5.1.4 EC-TX communication card outline structure

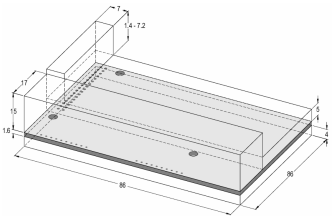


Figure 7.21 EC-TX communication card external dimensions (Unit: mm)

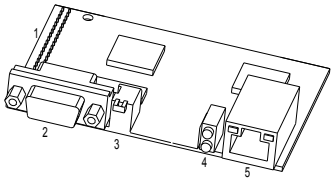


Figure 7-22 Appearance of EC-TX communication card

1: Control board port

2: Bus communication port

3: Bus terminators

5: LEDs indicator

6: Ethernet port

7.5.1.5 EC-TX related product information

EC-TX communication card is compatible with the following products:

- ●EC-TX is compatible with all following inveters supporting Profibus extension
- ●Master station supporting Profibus-DP protocol

Delivery list

The package of EC-TX communication card contains：

- ● EC-TX communication card
- ● EC-TX series operation manual

Please contact with our company or suppliers if there is something missing. Note will not be given for the reason of product upgrades.

7.5.2 Communication card installation

7.5.2.1 Communication card mechanical installation

Installation ambient

- ● Ambient temperature: 0 ℃ ~ +40 ℃
- ● Relative humidity: 5% ~ 95%
- ● Other climate conditions: no drew, ice, rain, snow, hail air condition and the solar radiation is below 700W/m^2， air pressure 70~106kPa
- ● Salt spray and corrosive gases: Pollution Level 2

- Dust and solid particles content: Pollution Level 2
- Vibration and shock: 5.9m/s^2 (0.6g) on 9~ 200Hz sinusoidal vibration

Installation:

Fix the three plastic columns on the location holes (H5, H6 and H7). And then fit EC-TX communication card on the slot marked J20 on the control panel. The signals of control panel and EC-TX communication card module is transferred by J20 connector (34 frames).

Installation step：

- Fix the three plastic columns on the location holes(H5, H6 and H7).
- Insert the module into the defined location carefully and fix it on the connection column.
- Set the bus terminal switch of the module to the needed location.

Note:

Disconnect the device from the power line before installation. Wait for at least three minutes to let the capacitors discharge. Cut off dangerous voltage from external control circuit to the unit output and input terminals.

Some electric components on the circuit board of EC-TX module are sensitive to static charge. Do not touch the circuit board. If you have to operate on it, please wear the grounding wrist belt.

7.5.2.2 Communication card electrical Installation

7.5.2.2.1 Node selection

Node address is the only address of Profibus on the bus. The address which is among 00~99 is shown with two figures and is selected by the spinning switch on the module. The left switch shows the first figure, and the right one show the second figure.

Node address = 10 x the first digital value + the second digital value x 1

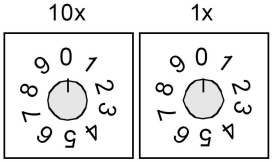


Figure 7-23 Node selection

7.5.2.2.2 Bus terminators

There is a bus terminal in each heading and ending to avoid error during operation. The DIP switch on RPBA-01PCB is used to connect the bus terminals which can avoid the signal feedback from the bus cables. If the module is the first or last one in the internet, the bus terminal should be set as ON. Please disconnect EC-TX terminals when the Profibus D-sub connector with internal terminals is in use.

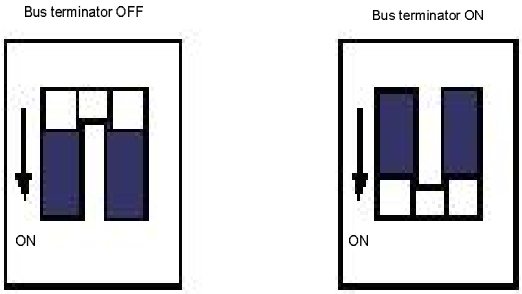


Figure 7-24 Bus terminators

7.5.2.3 EC-TX communication card bus network connection

Bus communication interface

Shielded twisted-pair copper wire (in line with RS485 standard) transmission is the most common way in Profibus transmission.

Transmission basic characteristics:

● Network topology: linear bus, there are bus terminal resistors at both ends.

● Transmission rate: 9.6K bit / s ~ 12M bit / s

● Medium: double-shielded twisted pair cables，the shield can be removed according to the environment (EMC).

● Dots number：There are 32 dots in each segment (without relays) as to 127 dots (with relays).

● Contact pin：9 frames D pin, the connector contact pins are as below：

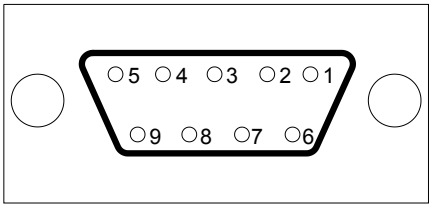


Figure 7-25 Connector pin sequencing

Pin arrangement adapting to Profibus protocol:

Table 7.1 Connector pin allocation

Connector pin		Description
1	-	Unused
2	-	Unused
3	B-Line	Data positive (twisted pair 1)
4	RTS	Sending request
5	GND_BUS	Isolated ground

Connector pin		Description
6	+5V BUS	Isolated 5V DC power supply
7	-	Unused
8	A-Line	Data negative (twisted pair 2)
9	-	Unused
Housing	SHLD	Profibus shielded cable

Pin arrangement adapting to CAN protocol:

Table 7.2 Connector pin allocation

Connector pin		Description
1	-	Unused
2	CANL	CAN bus L signal
3	GND_BUS	Isolated ground
4	RTS	Sending request
5	SHLD	Shielded cable
6	GND_BUS	Isolated ground
7	CANH	CAN bus H signal
8	-	Unused
9	-	Unused
Housing	SHLD	Shielded cable

+5 V and GND_BUS are used for bus terminators. Some devices, such as optical transceivers (RS485), may need to obtain an external power supply from these pins.

In some devices, use the RTS to determine sending direction. In normal applications, only use A-Line, B-Line and shielded layer.

It is recommended to use the standard DB9 port produced by SIEMENS. Please refer to wiring standard if the required communication baud rate is greater than 187.5kbps.

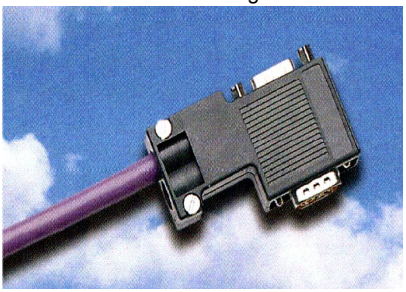


Figure 7-26 Standard Profibus port

Repeater

Up to 32 stations can be connected to each segment (master station or subsidiary stations), the repeater have to be used when stations is more than 32. Repeaters in series are generally no more than 3. (Note: There is no repeater station address)

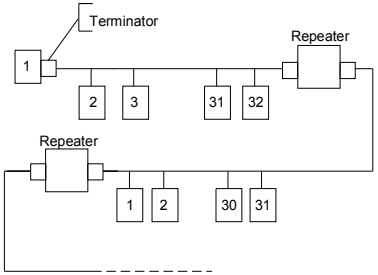


Figure 7-27 Up to 32 stations on each section

7.5.2.4 Transmission rate and maximum distance

Maximum length of cable depends on the transmission rate.

Table 7.2 shows the relationship between transmission rate and distance.

Table 7.2 Bus transmission distance

Transmission **rate (kbps)**	**A-wire (m)**	**B-wire (m)**
9.6	1200	1200
19.2	1200	1200
93.75	1200	1200
187.5	1000	600
500	400	200
1500	200	-----
12000	100	-----

Table 7.3Transmission line parameters

Transmission **rate (kbps)**	**A-wire (m)**	**B-wire (m)**
Impedance (Ω)	135~165	100~130
Capacitance per unit length(pF/m)	< 30	< 60
Loop Resistance (Ω/km)	110	--------
Core wire diameter (mm)	0.64	> 0.53
Line-core cross-section (mm^2)	> 0.34	> 0.22

Besides shielding twisted-pair copper wires, Profibus can also use optical fiber for transmission in an electromagnetic interference environment to increase the high-speed transmission distance there are two kinds of fiber optical conductors, one is low-cost plastic fiber conductor,

used distance is less than 50 meters, the other is glass fiber conductor, and used distance is less than 1 km.

7.5.2.5 Profibus bus connection diagram

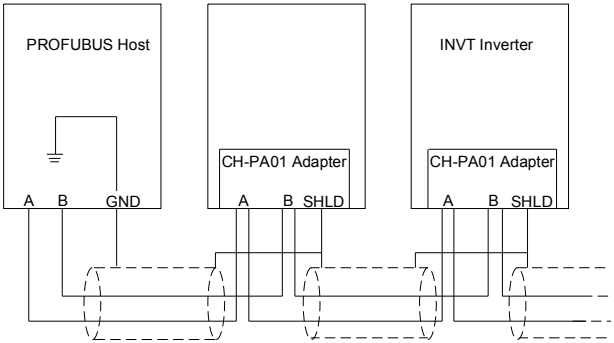


Figure7-28 Standard profibus cable wiring diagram

Above is "terminal" wiring diagram. Cable is a standard Profibus cable consisting of a twisted pair and shielding layer. The shielded layer of Profibus cable on all nodes is directly grounded. Users can choose the best grounding method according to the situation.

Wiring precautions

Make sure that signal lines do not twist when connecting all stations. Shielded cable should be used when system runs under high electromagnetic interface environment, which can improve electromagnetic compatibility (EMC).

If using shielded braided wire and shielding foil, both ends should be connected to ground. Using shielding area should be large enough to maintain a good conductivity. And data lines must be separated from high-voltage.

Stub line segment should not be used when transmission rate more than 500K bit/s, The plug is available on the market which connects directly to data input and output cable. Bus plug connection can be on or off at any time without interruption of data communications of other station.

7.5.3 System configuration

7.5.3.1 System Configuration

Master station and inverter should be configured so that the master station can communicate with the module after correctly installing EC-TX communication card module.

Each Profibus subsidiary station on the Profibus bus need to have "device description document" named GSD file which used to describe the characteristics of Profibus-DP devices. The software we provided for the user includes inverter related GSD files (device data files) information, users can obtain type definition file (GSD) of master machines from local INVT

agent.

Table 7.4 EC-TX configuration parameters

Parameter Number	Parameter Name	optional setting	Factory setting
0	Module type	Read only	Profibus-DP
1	Node address	0~99	2
2	PZD3	0~65535	0
3	PZD4	Ibid	0
…	……	Ibid	0
9	PZD12	Ibid	0

7.5.3.2 Module type

This parameter shows communication module type detected by inverter; users can not adjust this parameter. If this parameter is not defined, communication between the modules and inverter can not be established.

7.5.3.3 Node address

In Profibus network, each device corresponds to a unique node address, you can use the node address selection switch to define node address (switch isn't at 0) and the parameter is only used to display the node address. If node address selection switch is 0, this parameter can define node address. The user can not adjust the parameter by themselves and the parameter is only used to display the node address..

7.5.3.4 GSD file

In Profibus network, each Profibus subsidiary station needs GSD file "device description document" which used to describe the characteristics of Profibus-DP devices. GSD file contains all defined parameters, including baud rate, information length, amount of input/output data, meaning of diagnostic data.

A CD-ROM will be offered in which contains GSD file (extension name is .gsd) for fieldbus communication card. Users can copy GSD file to relevant subdirectory of configuration tools, please refer to relevant system configuration software instructions to know specific operations and Profibus system configuration.

7.5.4 Profibus-DP communication

7.5.4.1 Profibus-DP

Profibus-DP is a distributed I/O system, which enables master machine to use a large number of peripheral modules and field devices. Data transmission shows cycle: master machine read input information from subsidiary machine then give feedback signal. EC-TX communication card module supports Profibus-DP protocol.

Service access point

Profibus-DP has access to Profibus data link layer (Layer 2) services through service access point SAP. Every independent SAP has clearly defined function. Please refer to relevant Profibus user manual to know more about service access point information. PROFIDRIVE-Variable speed drive adopts Profibus model or EN50170 standards (Profibus protocol).

7.5.4.2 Profibus-DP information frame data structures

Profibus-DP bus mode allows rapid data exchange between master station and inverter. Adopting master-slave mode dealing with inverter access, inverter is always subsidiary station, and each has definite address. Profibus periodic transmission messages use 16 words (16 bit) transmission, the structure shown in figure 7.26.

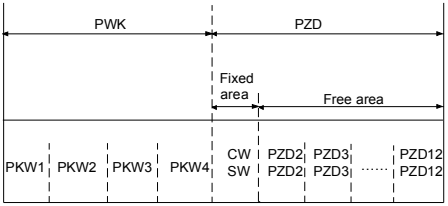


Figure 7-29 Profibus-DP message structure

Parameters area:

PKW1-Parameter identification

PKW2-array index number

PKW3-parameter value 1

PKW4-parameter value 2

Process data:

CW-Control word (from master to slave, see Table 7.5)

SW-status word (from slave to master, see Table 7.7)

PZD-process data (decided by users) (From master to slave output【given value】, from slave to master input【actual value】)

PZD area (process data area)

PZD area of communication message is designed for control and monitor inverter. PZD from master and slave station is addressed in high priority; the priority of dealing with PZD is superior to that of PKW, and always sends current valid date from interface.

Control word (CW) and status word (SW)

Control word (CW) is a basic method of fieldbus system controlling inverter. It is sent by the fieldbus master station to inverter and the communication card module act as gateway. Inverter responds according to the control word and gives feedbacks to master machine through status

word (SW).

Contents of control word and status word are shown in table 7.5 and table 7.7 respectively. Please refer to inverter manual to know bit code.

Given value

Inverter can receive control information by several ways, these channels include: analog and digital input terminals, inverter control board and module communication (such as RS485, EC-TX communication card modules). In order to use Profibus control inverter, the communication module must be set to be inverter controller.

Contents of setting value are shown in Table 7.6.

Actual value

Actual value is a 16-bit word, which contains converter operation information. Monitoring capabilities are defined by inverter parameter. The integer scaling of actual value is sent to master machine depending on selected function, please refer to inverter manual.

Contents of actual values are shown in Table 7.8.

Note: inverter always check the control word (CW) and bytes of given value.

Mission message (From master station to inverter)

Control word (CW)

The first word of PZD is control word (CW) of inverter; due to different control word (CW) of PWM rectifier regenerative part and inverter part Illustration is depart in next two tables.

Table 7.5 Control word (CW) of CHV190

Bit	Name	Value	Status/Description
00	HEARTBEAT REF	1	Heartbeat enable
		0	Heartbeat banned
01	EXTERNAL RESET	1	Fault reset, if the fault still exists
		0	Continue running normally
02	FORWARD COMMAND	1	Forward command
		0	Deceleration stop
03	REVERSE COMMAND	1	Reverse command
		0	Deceleration stop
04	EXCITING COMMAND	1	Excitation enable
		0	Excitation unable
05	TORQUE CONTROL SELECTION	1	Torque control enable
		0	Torque control banned
06	EXTERNAL SAFE SWITCH	1	External safe switching enable
		0	Coast to stop
07	QUICK STOP COMMAND	1	Continue running normally

Bit	Name	Value	Status/Description
		0	Emergency disconnect, fast stop deceleration mode
08	MOTO GROUP COMBINATION-1	1	BIT8 and BIT10 determine the motor, the corresponding relationship BIT10，BIT8: 00-basic motor parameter group; 01-extension motor group 1; 10- extension motor group 2； 11- extension motor group 3
		0	
09	WRITE ENABLE	1	Write enable (mainly PKW1-PKW4)
		0	Write unable
10	MOTO GROUP COMBINATION-2	1	Determine the motor selected with BIT8
		0	
11 To 15	Reserved	1	Reserved
		0	Reserved

Setting value (REF):

From 2nd word to 12th of PZD task message is the main setting value REF, main frequency setting value is offered by main setting signal source. As PWM rectifier feedback part doesn't have main frequency setting part, corresponding settings belong to reserved part, the following table shows inverter part settings for CHV 190.

Table 7.6 CHV190 settings

Bit	Name	From master to slave
PZD2	SPEED REF	Decided by master
PZD3	TENSION REF	Decided by master
PZD4	CURRENT LIMIT CLAMP	Decided by master
PZD5~ PZD12	Reserved	Reserved

Response message (From inverter to master)

Status word (SW):

The first word of PZD response message is status word (SW) of inverter, the definition of status word is as follows:

Table 7.7 Status Word (SW) of CHV190

Bit	Name	Value	Status/Description
00	HEARTBEAT FEEDBACK	1	Heartbeat feedback

Bit	Name	Value	Status/Description
		0	No heartbeat feedback
01	FAULT	1	Fault
		0	No fault
02	DC VOLTAGE ESTABLISH	1	DC voltage established
		0	DC voltage unestablished
03	MOTO GROUP FEEDBACK-1	1	BIT3 and BIT14 determine the motor, the corresponding relationship BIT3, BIT14: 00-basic motor parameter group; 01-extension motor group 1; 10- extension motor group 2; 11- extension motor group 3
		0	
04	QUICK STOP FEEDBACK	1	Stop invalid
		0	Emergency stop in fastest speed enable
05	DRIVE CURRENT LIMIT FEEDBACK	1	Drive current limit feedback enable
		0	Drive current limit feedback unable
06	DRIVE FLUX ENABLED	1	Drive flux enabled
		0	Drive flux disabled
07	RUNNING FORWARD	1	Running forward
		0	No running forward
08	RUNNING REVERSE	1	Running reverse
		0	No running reverse
09	MOTOR TEMPERATURE	1	Motor temperature alarm
		0	No motor temperature alarm
10	FLUX IN EXCITING	1	Flux in exciting
		0	Flux establish
11	MASTER MODE	1	The master mode on master-slave mode
		0	Not the master mode
12	SLAVE MODE	1	The slave mode on

Bit	Name	Value	Status/Description
			master-slave mode
		0	Not the slave mode
13	TORQUE CONTROL	1	Current torque control
		0	Speed control mode
14	MOTO GROUP FEEDBACK-2	0~1	Feedback the current selected parameter with BIT3
15	Reserved		

Actual value (ACT):

From 2nd word to 12th of PZD task message is main setting value ACT, main frequency setting value is offered by main setting signal source.

Table 7.8 Actual value of CHV190

Bit	Name	From slave to master
PZD2	FAULT CODE	Fault code:0~N
PZD3	SPEED FEEDBACK	Speed feedback actual value
PZD4	PG POS COUNTER	PG Card position
PZD5	DRIVE TORQUE FEEDBACK	Torque actual value
PZD6	Motor Running Freq.	Actual value of motor running freq.
PZD7	DRIVE CURRENT FEEDBACK	Drive current feedback actual value
PZD8	DRIVE VOLTAGE FEEDBACK	Drive voltage feedback actual value
PZD9-PZD12	Reserved	Reserved

PKW area (parameter identification marks PKW1-value area)

PKW area describes treatment of parameter identification interface, PKW interface is a mechanism which determine parameters transmission between two communication partners, such as reading and writing parameter values.

Structure of PKW area:

Figure 7-30 Parameter identification zone

In the process of periodic Profibus-DP communication, PKW area is composed of four words (16 bit), each word is defined as follows:

The first word

The first word PKW1 (16 bit)		
Bit 15~00	Task or response identification marks	0~7

The second word

The second word PKW2 (16 bit)		
Bit 15~00	Basic parameters address	0~247

The third word

The third word PKW3 (16 bit)		
Bit 15~00	Parameter value (high word) or return error code value	00

The fourth word

The fourth word PKW4 (16 bit)		
Bit 15~00	Parameter value (low word)	0~65535

Note: If the master requests one parameter value, the value of PKW3 and PKW4 will not be valid.

Task requests and responses

When passing data to slave machine, master machine use request label while slave machine use response label to positive or negative confirmation. Table 5.5 and Table 5.6 list the request/response functional.

The definition of task logo PKW1 is as follows:

Table 7.9 Definition of task logo PKW1

Request label (From master to slave)		**Response label**	
Request	Function	Positive confirmation	Negative confirmation
0	No task	0	—
1	Request parameter value	1,2	3
2	Modification parameter value (one word) [only change RAM]	1	3 or 4
3	Modification parameter value (double word) [only change RAM]	2	3 or 4
4	Modification parameter value (one word) [RAM and EEPROM are modified]	1	3 or 4
5	Modification parameter value (double word)	2	3 or 4

Request label (From master to slave)		Response label	
	[RAM and EEPROM are modified]		

Request label

"2"-modification parameter value (one word) [only change RAM],

"3"-modification parameter value (double word) [only change RAM]

"5"-modification parameter value (double word) [RAM and EPROM are modified] not support.

Reponses logo PKW1 defines as below:

Table 7.10 Definition of response logo PKW1

Response label (From slave to master)	
Confirmation	**Function**
0	No response
1	Transmission parameter value (one word)
2	Transmission parameter value (two word)
3	Task can not be executed and returns the following error number: 0: Illegal parameter number 1: Parameter values can not be changed (read-only parameter) 2: Out of setting value range 3: The sub-index number is not correct 4: Setting is not allowed (only reset) 5: Data type is invalid 6: The task could not be implemented due to operational status 7: Request isn't supported. 8: Request can't be completed due to communication error 9: Fault occurs when write operation to stationary store 10: Request fails due to timeout 11: Parameter can not be assigned to PZD 12: Control word bit can't be allocated 13: Other errors
4	No parameter change rights

Example for PKW:

Example 1: Read parameter value

Read keypad setting frequency value (the address of keypad setting frequency is 4) which can be achieved by setting PKW1 as 1, PKW2 as 4, return value is in PKW4.

Request (From master to inverter):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		···	PZD12	
Requst	00	01	00	04	00	00	00	00	xx	xx	xx	xx	xx	xx	···	xx	xx

0004: Parameter address

0001: Request read parameter

Response (From inverter to master)

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		···	PZD12	
Response	00	01	00	04	00	00	50	00	xx	xx	xx	xx	xx	xx	···	xx	xx

5000: Address 4 parameter

0001: Reponse (Parameter values refreshed)

Example 2: Modify the parameter values (RAM and EEPROM are modified)

Modify keypad settings frequency value (the address of keypad setting frequency is 4) which can be achieved by setting PKW1 as 2; PKW2 as 4, modification value (50.00) is in PKW4.

Request (From master to inverter):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		···	PZD12	
Requst	00	02	00	04	00	00	50	00	xx	xx	xx	xx	xx	xx	···	xx	xx

5000: Address 4 parameter

0004: Parameter changes

Response (From inverter to master)

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		···	PZD12	
Response	00	01	00	04	00	00	50	00	xx	xx	xx	xx	xx	xx	···	xx	xx

0001: Response (Parameter values refreshed)

Example for PZD:

Transmission of PZD area is achieved through inverter function code; please refer to relevant INVT inverter user manual to know relevant function code.

Example 1: Read process data of inverter

Inverter parameter selects "8: Run frequency" as PZD3 to transmit which can be achieved by setting Pd.14 as 8. This operation is mandatory until the parameter is instead of others.

Request (From master to inverter):

	PKW1	PKW2	PKW3	PKW4	CW	PZD2	PZD3	…	PZD12

Response	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	0A	…	xx	xx

Example 2: Write process data into inverter

Inverter parameter selects "2: Traction given" from PZD3 which can be achieved by setting Pd.03 as 2. In each request frame, parameters will use PZD3 to update until re-select a parameter.

Request (From master to converter):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		…	PZD12	
Response	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	00	…	xx	xx

In each request frame contents of PZD3 are given by traction until re-select a parameter.

7.5.5 Fault information

EC-TX module is equipped with three fault display LEDs as shown is figure 7.27. The roles of these LEDs are as follows:

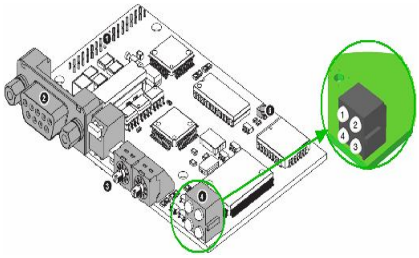


Figure 7-31 Fault display LEDS

LED No.	Name	Color	Function
1	Main display	Green	ON--Connection works
		Red	ON-Connection lost for ever Flashes- Connection lost for temporary
2	Online	Green	ON-module online and data can be exchanged. OFF-module is not in "online" state.
3	Offline	Red	ON-module offline and data can't be exchanged. OFF-module is not in "offline" state.
4	Fault	Red	Flicker frequency 1Hz-configuration error: The length of user parameter data sets is different from that of network configuration process during module initialization process. Flicker frequency 2Hz-user parameter data error: The length or content of user parameter data sets is

LED No.	Name	Color	Function
			different from that of network configuration process during module initialization process. Flicker frequency 4Hz-Profibus communication ASIC initialization error. OFF-Diagnostic closed.

7.6 Ethernet communication description

Ethernet function is integrated within CHV190, interface is CN12, please use standard Ethernet RJ45 cable with the upper PC software provided by INVT. All parameters within inverter can be easily set up, upload, download through the upper PC. It's easy to monitor up to more than 100 messages waveform real time within inverter.

CHV190 has "black box" function; inverter can keep 0.2s information waveform before the last fault. The information can be extracted through the upper PC computer software and it's easy to analyze fault cause.

8. Trouble shooting

8.1 Fault and Trouble Shooting

CHV190 series inverters have the complete protective function to implement effective protection during working. However, some trouble instructions may occurs during the utilization. Please ananlysis to estimate the fault reason and settle the problem as the following table. If the device is damaged and never run, please turn to the local supplier, the service center and the manufacturer for solution.

Fault code	Fault type	Reason	Solution
OUT1	IGBT Ph-U fault	1. Acc/Dec time is too short. 2. IGBT module fault. 3. Malfunction caused by interference. 4. Grounding is not properly.	1. Increase Acc/Dec time. 2. Ask for support. 3. Inspect external equipment and eliminate interference.
OUT2	IGBT Ph-V fault		
OUT3	IGBT Ph-W fault		
OC1	Over-current when acceleration	1. Short-circuit or ground fault occurred at inverter output. 2. Load is too heavy or Acc/Dec time is too short. 3. V/F curve is not suitable. 4. Sudden change of load.	1. Inspect whether motor damaged, insulation worn or cable damaged. 2. Increase Acc/Dec time or select bigger capacity inverter. 3. Check and adjust V/F curve. 4. Check the load.
OC2	Over-current when deceleration		
OC3	Over-current when constant speed running		
OV1	Over-voltage when acceleration	1. Dec time is too short and regenerative energy from the motor is too large. 2. Input voltage is too high.	1. Increase Dec time or connect braking resistor. 2. Decrease input voltage within specification.
OV2	Over-voltage when deceleration		
OV3	Over-voltage when constant speed running		
UV	DC bus Undervoltage	1. Open phase occurred with power	Inspect the input power supply or

Fault code	Fault type	Reason	Solution
		supply. 2. Momentary power loss occurred 3. Wiring terminals for input power supply are loose. 4. Voltage fluctuations in power supply are too large.	wiring.
OL1	Motor overload	1. Motor drive heavy load at low speed for a long time. 2. Improper V/F curve 3. Improper motor's overload protection threshold (Pb.03) 4. Sudden change of load.	1. Select variable frequency motor. 2. Check and adjust V/F curve. 3. Check and adjust Pb.03. 4. Check the load.
OL2	Inverter overload	1. Load is too heavy or Acc/Dec time is too short. 2. Improper V/F curve 3. Capacity of inverter is too small.	1. Increase Acc/Dec time or select bigger capacity inverter. 2. Check and adjust V/F curve. 3. Select bigger capacity inverter.
SPI	Input phase loss	1. Open-phase occurred in power supply. 2. Momentary power loss occurred. 3. Wiring terminals for input power supply are loose.	Check the wiring, installation and power supply.

Fault code	Fault type	Reason	Solution
		4. Voltage fluctuations in power supply are too large. 5. Voltage balance between phases is bad.	
SPO	Output phase loss	1. There is a broken wire in the output cable 2. There is a broken wire in the motor winding. 3. Output terminals are loose.	Check the wiring and installation.
OH1	Rectify overheat	1. Ambient temperature is too high. 2. Near heat source. 3. Cooling fans of inverter stop or damaged. 4. Obstruction of ventilation channel 5. Carrier frequency too high.	1. Install cooling unit. 2. Remove heat source. 3. Replace cooling fan 4. Clear the ventilation channel. 5. Decrease carrier frequency.
OH2	IGBT overheat		
EF	External fault	Sx: External fault input terminal take effect.	Inspect external equipment.
CE	Communication fault	1. Improper baud rate setting. 2. Receive wrong data. 3. Communication is interrupted for Long time.	1. Set proper baud rate. 2. Check communication devices and signals.

Fault code	Fault type	Reason	Solution
ITE	Current detection circuit error	1. Wires or connectors of control board are loose. 2. Hall sensor is damaged. 3. Amplifying circuit is abnormal.	1. Check the wiring. 2. Ask for support.
TE	Autotuning fault	1. Improper setting of motor rated parameters. 2. Overtime of autotuning.	1. Set rated parameters according to motor nameplate. 2. Check motor's wiring.
PCE	Encoder fault	1. Signal wire of encoder was broken. 2. Encoder was damaged.	1. Inspect encoder connection. 2. Inspect whether the encoder output signal or not.
PCDE	Encoder reverse fault	Encoder signal wire was connected wrong.	Adjust encoder wiring.
EEP	EEPROM read/write fault	Read/Write fault of control parameters.	Press STOP/RESET to reset. Ask for support.
PPPE	Magnetic pole position failure	The position of autotuning magnetic pole was detected wrong.	1.Check parameters of motor 2. Set rated parameters according to motor and autotuning again.
BCE	Braking unit fault	1. Braking circuit failure or brake tube damaged. 2. Too low resistance of externally	1. Inspect braking unit, replace braking tube. 2. Increase braking resistance.

Fault code	Fault type	Reason	Solution
		connected braking resistor.	
-END-	Trial time reached	Trial time which determined by factory reached.	Contact supplier and ask for support.
LCD-E	LCD disconnected	1. LCD disconnected. 2. Material broken during tension control.	1. Press STOP/RST to reset, connect LCD then download or upload parameter. 2. Check material.
FAE	Brake feedback fault	The feedback of brake is error,	Inspect the controlling system of crane.
TbE	Contactor feedback fault	The feedback of contactor is error,	Inspect the controlling system of crane.
TPF	Torque verification fault	Torque verification is unsuccessful.	Check torque verify.
OFE	Motor speed fault	The actual motor speed exceeds the set speed.	Check control system and load.
TFT	Torque Monitoring fault	The monitoring of torque is error.	Check control system and load.
PCF	Profibus communication fault	The communication of Profibus is unsuccessful.	Check Profibus communication module and communication links.
ELS	Master-slave speed synchronization fault	The position error between master and slave exceeds the position bias limit	Adjust the master and slave position and recount the master-slave.
STEP	Multi-step speed rating fault	The lower classification contact is	Please connect the lower classification at

Fault code	Fault type	Reason	Solution
		disconnected, the higher classification contact is connected.	first, and then connect the more advanced classification.
STC	Operating lever fault	Operating lever has not returned to zero position.	Put the operating lever back zero.
ETH	Earth connection fault	Grounding is error.	Given speed is set by analog, GND disconnect.
CANE	CAN bus communication fault	Improper baud rate setting.	Set proper baud rate.
		Receive data error.	Press STOP/RST to reset. Ask for support.
		Communication is interrupted for Long time.	Check communication devices and signals.
OH3	Motor over-temperature fault	Motor temperature is too high.	Check motor.
		Temperature sensor is damaged.	Check temperature sensor.
		Temperature sensor wirings loose.	Check temperature sensor wiring.

8.2 Common faults and solutions

◆ Inverter may have following faults or malfunctions during operation, please refer to the following solutions.

No display after power on:

Inspect whether the voltage of power supply is the same as the inverter rated voltage or not with multi-meter. If the power supply has problem, inspect and solve it.

Check the CHARGE light. If the light is off, the fault is mainly in the rectify bridge or the buffer resistor. If the light is on, the fault may be lies in the switching power supply. Please ask for support.

Power supply air switch trips off when power on:

◆ Inspect whether the input power supply is grounded or short circuit. Please solve the problem.

◆ Inspect whether the rectify bridge has been burnt or not. If it is damaged, ask for support.

Motor doesn't move after inverter running:

◆ Inspect if there is balance three-phase output among U, V, W. If yes, then motor could be damaged, or mechanically locked. Please solve it.

◆If the output is unbalanced or lost, the inverter drive board or the output module may be damaged, ask for support.

Inverter displays normally when power on, but switch at the input side trips when running:

◆ Inspect whether the output side of inverter is short circuit. If yes, ask for support.

◆ Inspect whether ground fault exists. If yes, solve it.

◆ If trip happens occasionally and the distance between motor and inverter is relatively long, it is recommended to install output AC reactor.

9. Maintenance

WARNING

- **Maintenance must be performed according to designated maintenance methods.**
- Only qualified techinician are allowed to carry out the **maintenance.**
- Disconnect the power supply before maintenance**. Wait for 10 minutes before maintenance.**
- **Do not touch the components or devices on PCB board directly. Otherwise inverter may be damaged by electrostatic.**
- Check to ensure the tiughtness of the screws after the **maintenance.**

9.1 Daily maintenance

Daily maintenance should be performed for the avoidance of the fault and insurance of the normal operation and long usage. See the following table for the detailed maintenance:

Items	Instructions
Temperature/Humility	Check to ensure the ambient temperature is among 0℃~50℃ and the humility is among 20~90%.
Oil fog and dust	Check to ensure there is no oil fog, dust and condensation in the inverter.
The inverter	Check to ensure that there is abnormal heating and viberation in the inverter.
The fan	Check to ensure the fan works normally and there is no foreign objection in the inverter.
Input power supply	Check to ensure the voltage and frequency of the input power supply is in the allowed range.
The motor	Check to ensure there is no abnormal viberation, heating, noise and phase loss on the motor.

9.2 Periodic maintenance

The user has to check the inverter periodically (within half year) for the avoidance of fault and stable and longterm high-performance running. See the following table for the detailed check:

Items	Instructions	Method
The screws of	Check the screws are	Tight the screw driver/sleeve

Items	Instructions	Method
the external terminal	loose or not	
PCB board	Dust and dirtiness	Use dry and compressed air to clean the dirtiness completedly.
The fan	The accumulative time of abnormal noise and viberation is over 20 thousand hours.	1. Clean the foreign objections 2. Chang the fan
Electrolytic capacitors	Check the color changes or not and there is peculiar smell	Change the electrolytic capacitor
Radiator	Dust and dirtiness	Use dry and compressed air to clean the dirtiness completedly.
Power component	Dust and dirtiness	Use dry and compressed air to clean the dirtiness completedly.
Connection wires	Check to ensure the internal connection wires, plug-in parts and the plug of the extension card is available.	The screw driver and hands

9.3 Replacement of wearing parts

Fans and electrolytic capacitors are wearing part; please change the wearing parts periodically for a longterm, safe and smooth operation. The replacement periods of the wearing parts are as follows:

◆Fan: should be changed after 20,000 hours of utilization;

◆Electrolytic Capacitor: should be changed after 30,000~40, 000 hours of utilization.

9.4 Maintenance guarantee of the inverter

Our company provides 18-month maintenance service which is counted from the delivery date for CHV190 series inverters.

10. Communication protocol

10.1 Interfaces

RS485: asynchronous, half-duplex.

Default: 8-E-1, 19200bps. See Group PC parameter settings.

10.2 Communication Modes

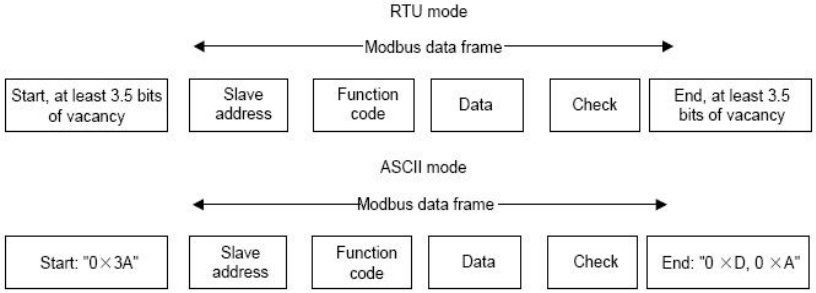
(1) The protocol is Modbus protocol. Besides the common register Read/Write operation, it is supplemented with commands of parameters management.

(2) The drive is a slave in the network. It communicates in 'point to point' master-slave mode. It will not respond to the command sent by the master via broadcast address.

(3) In the case of multi-drive communication or long-distance transmission, connecting a 100~120Ω resistor in parallel with the master signal line will help to enhance the immunity to interference.

10.3 Protocol Format

Modbus protocol supports both RTU and ASCII mode. The frame format is illustrated as follows:



Modbus adopts "Big Endian" representation for data frame. This means that when a numerical quantity larger than a byte is transmitted, the most significant byte is sent first.

RTU mode

In RTU mode, the Modbus minimum idle time between frames should be no less than 3.5 bytes. The checksum adopts CRC-16 method. All data except checksum itself sent will be counted into the calculation. Please refer to section: CRC Check for more information. Note that at least 3.5 bytes of Modbus idle time should be kept and the start and end idle time need not be summed up to it.

The table below shows the data frame of reading parameter 002 from slave node address 1.

Node adds.	Command	Data adds.		Read No.		CRC	
0x01	0x03	0x00	0x02	0x00	0x01	0x25	0xCA

The table below shows the reply frame from slave node address 1

Node adds.	Command	Bytes No.	Data		CRC	
0x01	0x03	0x02	0x00	0x00	0xB8	0x44

ASCII mode

In ASCII mode, the frame head is “0x3A”, and default frame tail is “0x0D” or “0x0A”. The frame tail can also be configured by users. Except frame head and tail, other bytes will be sent as two ASCII characters, first sending higher nibble and then lower nibble. The data have 7/8 bits. “A”~“F” corresponds to the ASCII code of respective capital letter. LRC check is used. LRC is calculated by adding all the successive bytes of the message except the head and tail, discarding any carriers, and then two’s complementing the result.

Example of Modbus data frame in ASCII mode:

The command frame of writing 0x0003 into address “0x1000” of slave node address 1 is shown in the table below:

LRC checksum = the complement of (01+06+10+00+0x00+0x03) = 0xE5

	Frame head	Node adds.		Command		Data adds.			
Code		0	1	0	6	1	0	0	0
ASCII	3A	30	31	30	36	31	30	30	30

Data to write				LRC		Frame tail	
0	0	0	3	E	5	CR	LF
30	30	30	33	45	35	0D	0A

10.4 Protocol Function

Different respond delay can be set through drive’s parameters to adapt to different needs. For RTU mode, the respond delay should be no less than 3.5 bytes interval, and for ASCII mode, no less than 1ms.

The main function of Modbus is to read and write parameters. The Modbus protocol supports the following commands:

0x03	Read inverter’s function parameter and status parameters
0x06	Write single function parameter or command parameter to inverter

All drive's function parameters, control and status parameters are mapped to Modbus R/W data address.

The data address of control and status parameters please refer to the following table.

Parameter Description	Address	Meaning of value	R/W Feature
Control command	1000H	0001H: Forward	W/R
		0002H: Reverse	
		0003H: JOG forward	
		0004H: JOG reverse	
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Reset fault	
		0008H: JOG stop	
Inverter status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Standby	
		0004H: Fault	
Communication setting	2000H	Communication Setting Range (-10000~10000) Note: the communication setting is the percentage of the relative value (-100.00%~100.00%). If it is set as frequency source, the value is the percentage of the maximum frequency (P0.07). If it is set as PID (preset value or feedback value), the value is the percentage of the PID.	W/R
Virtual terminal input function setting	2001H	Setting range: 000H~03FFH. Each bit corresponds to S1~S5, HDI1, HDI2 and S6~S8 respectively. **Note:** The functional code P5.01 should be set to the communication virtual terminal input function, and should also be unrelated to HDI1 and HDI2 input types.	W/R

Status parameters	3000H	Output speed	R
	3001H	Reference speed	R
	3002H	DC Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Running frequency	R
	3006H	Rotation speed	R
	3007H	Output power	R
	3008H	Output torque	R
	3009H	Input terminal status	R
	300AH	Output terminal status.	R
	300BH	Input of AI1	R
	300CH	Input of AI2	R
	300DH	Torque compensation	R
	300EH	Pole position	R
	300FH ~ 3014H	Reserved	R
	3015H	Torque direction (0: forward, 1: reverse)	R
	3016H	Device code	R
Parameter lock password check address	4000H	****	R
Parameter lock password command address	4001H	55AAH	R
Fault info address	5000H	This address stores the fault type of inverter. The meaning of each value is same as P7.15.	R

The above shows the format of the frame. Now we will introduce the Modbus command and data structure in details, which is called protocol data unit for simplicity. Also MSB stands for the most significant byte and LSB stands for the least significant byte for the same reason. The description below is data format in RTU mode. The length of data unit in ASCII mode should be

doubled.

Protocol data unit format of reading parameters:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x03
Data Address	2	0~0xFFFF
Read number	2	0x0001~0x0010

Reply format (success):

Protocol data unit	Data length(bytes)	Range
Command	1	0x03
Returned byte number	2	2* Read number
Content	2* Read number	

If the command is reading the type of inverter (data address 0x3016), the content value in reply message is the device code:

The high 8 bit of device code is the type of the inverter, and the low 8 bit of device code is the sub type of inverter.

For details, please refer to the following table:

High byte	Meaning	Low byte	Meaning
00	CHV	01	Universal type
		02	For water supply
		03	Middle frequency 1500Hz
		04	Middle frequency 3000Hz
01	CHE	01	Universal type
		02	Middle frequency 1500Hz
02	CHF	01	Universal type

If the operation fails, the inverter will reply a message formed by failure command and error code. The failure command is (Command＋0x80). The error code indicates the reason of the error; see the table below.

Value	Name	Mean
01H	Illegal command	The command from master can not be executed. The reason maybe:

		1. This command is only for new version and this version can not realize. 2. Slave is in fault status and can not execute it.
02H	Illegal data address.	Some of the operation addresses are invalid or not allowed to access.
03H	Illegal value	When there are invalid data in the message framed received by slave. Note: This error code does not indicate the data value to write exceed the range, but indicate the message frame is a illegal frame.
06H	Slave busy	Inverter is busy(EEPROM is storing)
10H	Password error	The password written to the password check address is not same as the password set by P7.00.
11H	Check error	The CRC (RTU mode) or LRC (ASCII mode) check not passed.
12H	Written not allowed.	It only happen in write command, the reason maybe: 1. the data to write exceed the range of according parameter 2. The parameter should not be modified now. 3. The terminal has already been used.
13H	System locked	When password protection take effect and user does not unlock it, write/read the function parameter will return this error.

Protocol data unit format of writing single parameter:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x06
Data Address	2	0~0xFFFF
Write Content	2	0~0xFFFF

Reply format (success):

Protocol data unit	Data length(bytes)	Range
Command	1	0x06
Data Address	2	0~0xFFFF
Write Content	2	0~0xFFFF

If the operation fails, the inverter will reply a message formed by failure command and error code. The failure command is (Command＋0x80). The error code indicates the reason of the error; see table 1.

10.5 Note

10.5.1 Between frames, the span should not less than 3.5 bytes interval, otherwise, the message will be discarded.

10.5.2 Be cautious to modify the parameters of PC group through communication, otherwise may cause the communication interrupted.

10.5.3 In the same frame, if the spans between two .near bytes more than 1.5 bytes interval, the behind bytes will be assumed as the start of next message so that communication will failure.

10.6 CRC Check

For higher speed, CRC-16 uses tables. The following are C language source code for CRC-16.

```
unsigned int crc_cal_value(unsigned char *data_value,unsigned char data_length)
{
int i;
unsigned int crc_value=0xffff;
while(data_length--)
{
crc_value^=*data_value++;
        for(i=0;i<8;i++)
        {
if(crc_value&0x0001)crc_value=(crc_value>>1)^0xa001;
        else crc_value=crc_value>>1;
        }
  }
return(crc_value);
}
```

10.7 Example

10.7.1 RTU mode, read 2 data from 0004H

The request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	01H

Command	03H
High byte of start address	00H
Low byte of start address	04H
High byte of data number	00H
Low byte of data number	02H
Low byte of CRC	85H
High byte of CRC	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The reply is :

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	01H
Command	03H
Returned byte number	04H
Higher byte of 0004H	13H
Low byte of 0004H	88H
High byte of 0005H	05H
Low byte of 0005H	DCH
Low byte of CRC	7CH
High byte of CRC	54H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

10.7.2 ASCII mode, read 2 data from 0004H:

The request command is:

START	':'

Node address	‘0’
	‘1’
Command	‘0’
	‘3’
High byte of start address	‘0’
	‘0’
Low byte of start address	‘0’
	‘4’
High byte of data number	‘0’
	‘0’
Low byte of data number	‘0’
	‘2’
LRC CHK Hi	‘F’
LRC CHK Lo	‘6’
END Lo	CR
END Hi	LF

The reply is

START	‘:’
Node address	‘0’
	‘1’
Command	‘0’
	‘3’
Returned byte number	‘0’
	‘4’
Higher byte of 0004H	‘1’
	‘3’
Low byte of 0004H	‘8’
	‘8’
High byte of 0005H	‘0’
	‘5’
Low byte of 0005H	‘D’
	‘C’
LRC CHK Lo	‘7’
LRC CHK Hi	‘C’

END Lo	CR
END Hi	LF

10.7.3 RTU mode, write 5000(1388H) into address 0008H, slave node address 02.

The request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	02H
Command	06H
High byte of data address	00H
Low byte of data address	04H
High byte of write content	13H
Low byte of write content	88H
Low byte of CRC	C5H
High byte of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The reply command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	02H
Command	06H
High byte of data address	00H
Low byte of data address	04H
High byte of write content	13H
Low byte of write content	88H
Low byte of CRC	C5H

High byte of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

10.7.4 ASCII mode, write 5000(1388H) into address 0008H, slave node address 02.

The request command is:

START	':'
Node address	'0'
	'2'
Command	'0'
	'6'
High byte of data address	'0'
	'0'
Low byte of data address	'0'
	'4'
High byte of write content	'1'
	'3'
Low byte of write content	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'9'
END Lo	CR
END Hi	LF

The reply command is:

START	':'
Node address	'0'
	'2'
Command	'0'
	'6'
High byte of data address	'0'
	'0'
Low byte of data address	'0'

	‘4’
High byte of write content	‘1’
	‘3’
Low byte of write content	‘8’
	‘8’
LRC CHK Hi	‘5’
LRC CHK Lo	‘9’
END Lo	CR
END Hi	LF

Appendix A Dimensions

There are two structures: common structure and modular structure.

A.1 Common structure

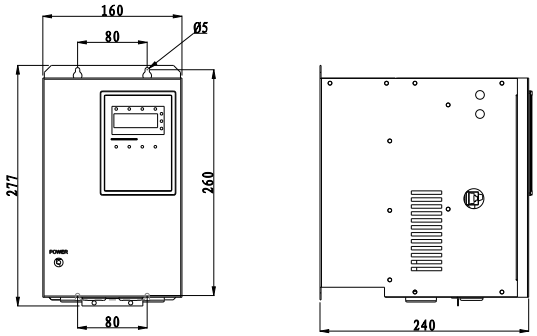


Figure A-1 External dimension of 4kW~5.5kW inverters

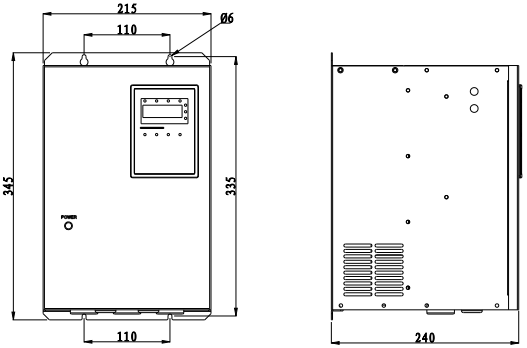


Figure A-2 External dimension of 7.5kW~15kW inverters

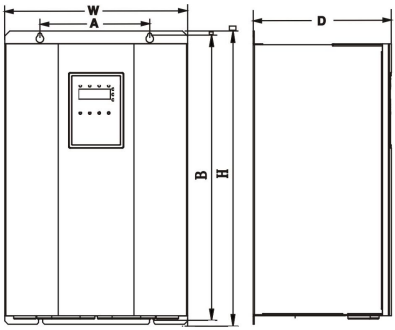


Figure A-3 External dimension of 18.5kW~110kW inverters

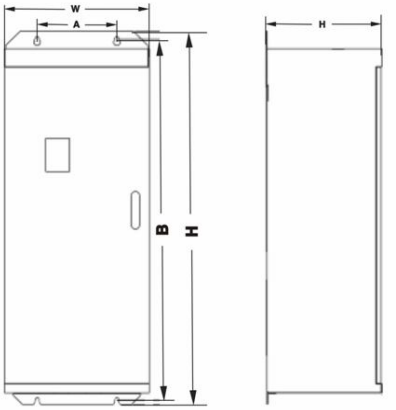
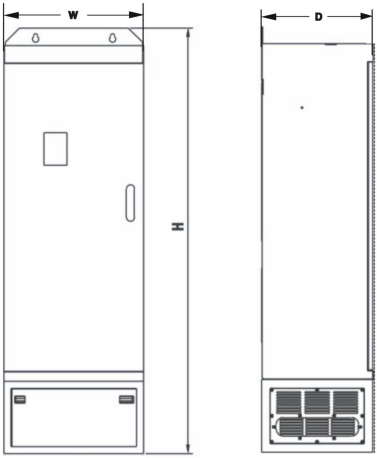


Figure A-4 External dimension of 132kW~315kW inverters1



FigureA-5External dimension of 132kW~315kW inverters2

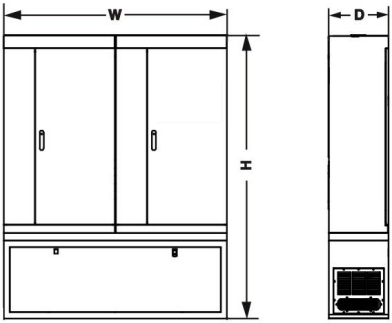


Figure A-6 External dimension of 350kW~500kW inverters

External and installation dimension of 380V inverters

Power(kW)	A(mm)	B(mm)	H(mm)	W(mm)	D(mm)	Installation Hole (mm)	Remark
	Installation Dimension		External Dimension				
4~5.5	80	260	277	160	240	5	——
7．5~15	110	335	345	215	240	6	——
18.5~30	176	454.5	467	290	215	6.5	——
37~55	230.0	564.5	577.0	375.0	270.0	7.0	——
75~110	320.0	738.5	755.0	460.0	330.0	9.0	——
132~185	270	1233	1275	490	391	13	H (Without base)
	——	——	1490	490	391	——	H (With base)
200~315	500	1324	1358	750	402	12.5	I (Without base)
	——	——	1670	750	402	——	I (With base)
350~500	——	——	1950	1200	502	——	——

External and installation dimension of 660V inverters

Power(kW)	A(mm)	B(mm)	H(mm)	W(mm)	D(mm)	Installation Hole (mm)	Remark
	Installation Dimension		External Dimension				
18~45	166.4	510.2	525	260.0	300.0	6.5	/
55~110	120	541.1	557.6	378.0	380.0	6.5	/
132~185	270	1233	1275	490	391	13	H (Without base)
	——	——	1490	490	391	——	H (With base)
200~350	500	1324	1358	750	402	12.5	I (Without base)

	——	——	1670	750	402	——	I (With base)
400~630	——	——	1950	1200	502	——	

A.2 Modular structure

Please refer to relavent documents of the structure.

A.3 Dimensions of external keypad

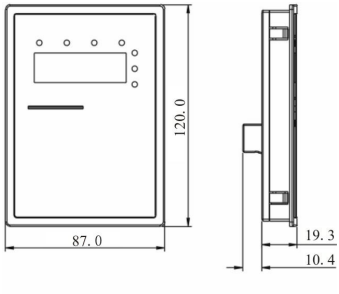


Figure A-5 Installation dimension

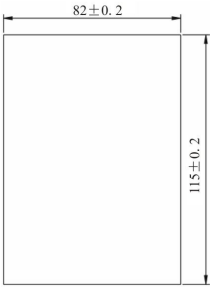


Figure A-6 Hole size

A.4 Installation space

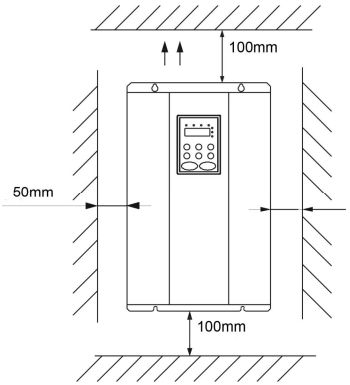


Figure A-7 Installation space

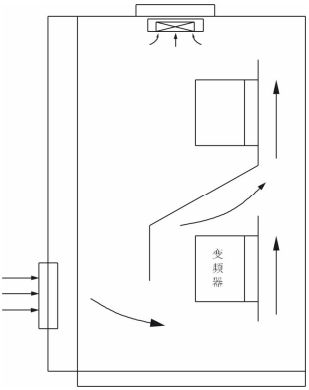


Figure A-8 Installation of multiple inverters

Note: Add the air deflector when apply the up-down installation.

Appendix B List of function parameters

The function parameters of CHV100 series inverters have been divided into 16 groups (P0~PE) according to the function. Each function group contains certain function codes applying 3-class menus. For example, “P8.08” means the eighth function code in the P8 group function, PE group is factory reserved, and users are forbidden to access these parameters.

For the convenience of function codes setting, the function group number corresponds to the first class menu, the function code corresponds to the second class menu and the function code corresponds to the third class menu.

1. Below is the instruction of the function lists:

The first line “Function code”：codes of function parameter group and parameters；

The second line “Name”：full name of function parameters；

The third line “Description”：detailed illustration of the function parameters

The forth line “Factory Setting”：the original factory set value of the function parameter；

The fifth line “Modify ”： the modifying character of function codes (the parameters can be modified or not and the modifying conditions)，below is the instruction：

“○”: means the set value of the parameter can be modified on stop and running state；

“◎”: means the set value of the parameter can not be modified on the running state；

“●”: means the value of the parameter is the real detection value which can not be modified.

The sixth line “LCD Display”: simple illustration for the function parameters

(The inverter has limited the automatic inspection of the modifying character of the parameters to help users avoid mismodifying)

2. “LCD Display” is only valid when external LCD operational panel is used.

3.” Factory setting” means the function parameter will restore to the default value during default parameters restoring. But the detected parameter or recorded value won’t be restored.

4. For a better parameter protection, the inverter provides password protection to the parameters. After setting the password (set P7.00 to any non-zero number), the system will come into the state of password verification firstly after the user press PRG/ESC to come into the function code editing state. And then“-----” will be displayed. Unless the user input right password, they cannot enter into the system. For the factory setting parameter zone, it needs correct factory password (remind that the users can not modify the factory parameters by themselves, otherwise, if the parameter setting is incorrect, damage to the inverter may occur). If the password protection is unlocked, the user can modify the password freely and the inverter will work as the last setting one. When P7.00 is set to 0, the password can be canceled. If P7.00 is not 0 during powering on, then the parameter is protected by the password. When

modify the parameters by serial communication, the function of the password follows the above rules, too.

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P0 Group: Basic Function					
P0.00	Speed control mode	0:Sensorless vector control 1:Vector control With PG 2:V/F control	0	◎	CONTROL MODE
P0.01	Run command source	0:Keypad (LOCAL/REMOT extinguished) 1:Terminal (LOCAL/REMOT flickering) 2:Communication (LOCAL/REMOT lights on) 3:Profibus command (LOCAL/REMOT lights on) 4:CAN command (LOCAL/REMOT lights on)	0	◎	RUN COMMAND
P0.02	UP/DOWN setting	0: Valid, save UP/DOWN value when power off 1: Valid, do not save UP/DOWN value when power off 2: Invalid 3：Valid during running, clear when power off	0	◎	UP/DOWN SETTING

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P0.03	Frequency A command source	0: Keypad 1: AI1 2. AI2 3: HDI1 4:Simple PLC 5: Multi-Step speeds 6: PID 7: Communication 8: Profibus communication 9: CAN communication	0	◎	FREQ SOURCE A
P0.04	Frequency B command source	0: Keypad 1: AI1 2. AI2 3: HDI1 4:Simple PLC 5: Multi-Step speeds 6: PID 7: Communication 8: Profibus communication 9: CAN communication	0	◎	FREQ SOURCE B
P0.05	Scale of frequency B command	0: Maximum frequency 1: Frequency A command	0	○	FREQ B SCALE
P0.06	Frequency command selection	0: A 1: B 2: A+B 3: Max(A, B)	0	○	FREQ SELECTION
P0.07	Maximum frequency	10.00~400.00Hz	50.00Hz	◎	MAX FREQ
P0.08	Upper frequency limit	P0.09~P0.07	50.00Hz	○	UP FREQ LIMIT

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P0.09	Lower frequency limit	0.00Hz~ P0.08	0.00Hz	○	LOW FREQ LIMIT
P0.10	Keypad reference frequency	0.00 Hz ~ P0.08	50.00Hz	○	KEYPAD REF FREQ
P0.11	Acceleration time 0	0.0~3600.0s	20.0s	○	ACC TIME 0
P0.12	Deceleration time 0	0.0~3600.0s	20.0s	○	DEC TIME 0
P0.13	Running direction selection	0: Forward 1: Reverse 2: Forbid reverse	0	◎	RUN DIRECTION
P0.14	Carrier frequency	0~16.0kHz	Depend on model	○	CARRIER FREQ
P0.15	PWM mode	0: 2-phase modulation 1: 3-phase modulation	0	○	PWM MODE
P0.16	Carrier frequency adjust	0: Disabled 1: Enabled	0	◎	AUTO ADJUST
P0.17	Motor parameters autotuning	0: No action 1: Rotation autotuning 2: Static autotuning	0	◎	AUTO-TUNING
P0.18	Restore parameters	0: No action 1: Restore factory setting 2: Clear fault records 3:Restore parameters for injection molding machine	0	◎	RESTORE PARA
P1 Group: Start and Stop Control					
P1.00	Start Mode	0: Start directly 1: DC braking and start 2: Speed tracking and start	0	◎	START MODE
P1.01	Starting frequency	0.00~10.0Hz	1.50Hz	◎	START FREQ

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P1.02	Hold time of starting frequency	0.0~50.0s	0.0s	◎	HOLD TIME
P1.03	DC Braking current before start	0.0~150.0%	0.0%	◎	START BRAK CURR
P1.04	DC Braking time before start	0.0~50.0s	0.0s	◎	START BRAK TIME
P1.05	Acceleration /Deceleration mode	0:Linear 1:S curve	0	◎	ACC/DEC MODE
P1.06	Start section of S curve	0.0~40.0% (ACC/DEC time)	30.0%	◎	START SECTION
P1.07	End section of S curve	0.0~40.0% (ACC/DEC time)	30.0%	◎	END SECTION
P1.08	Stop Mode	0:Decelerate to stop 1:Coast to stop	0	○	STOP MODE
P1.09	Starting frequency of DC braking	0.00~P0.07	0.00Hz	○	STOP BRAK FREQ
P1.10	Waiting time before DC braking	0.0~50.0s	0.0s	○	STOP BRAK DELAY
P1.11	DC braking current	0.0~150.0%	0.0%	○	STOP BRAK CURR
P1.12	DC braking time	0.0~50.0s	0.0s	○	STOP BRAK TIME
P1.13	Dead time of FWD/REV	0.0~3600.0s	0.0s	○	FWD/REV DEADTIME
P1.14	Action when running frequency is less than lower frequency limit	0: Running at the lower frequency limit 1: Stop 2: Stand-by	0	◎	ACT(FREQ< P0.09)

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P1.15	Restart after power off	0: Disabled 1: Enabled	0	○	RESTART
P1.16	Delay time for restart	0.0~3600.0s	0.0s	○	DELAY TIME
P2 Group: Motor Parameters					
P2.00	Inverter model	0: Asynchronous motor 1: Synchronous motor	0	◎	INVERTER MODEL
P2.01	Motor rated power	0.4~1200.0kW	Depend on model	◎	MOTOR RATE FREQ
P2.02	Motor rated speed	0~36000rpm	1460rpm	◎	MOTOR RATE SPEED
P2.03	Motor rated voltage	0~500V	380V	◎	MOTOR RATE VOLT
P2.04	Motor rated current	0.1~2000.0A	Depend on model	◎	MOTOR RATE CURR
P2.05	Motor rated frequency	0.01Hz~P0.07	50.00Hz	◎	MOTOR RATE POWER
P2.06	Depend on model	Depend on model	Depend on model	○	STATOR RESISTOR
P2.07	1460rpm	1460rpm	Depend on model	○	ROTOR RESISTOR
P2.08	380V	380V	Depend on model	○	LEAK INDUCTOR
P2.09	Depend on model	Depend on model	Depend on model	○	MUTUAL INDUCTOR
P2.10	50.00Hz	50.00Hz	Depend on model	○	NO LOAD CURR
P2.12	Magnetic pole initial position	0.00~360.00	0.00		

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P2.13	Magnetic pole position amplitude gain	0.50~1.50	1		
P2.14	C-phase magnetic pole position bias	0~9999	433		
P2.15	D-phase magnetic pole position bias	0~9999	433		
P2.16	Motor weak magnetic coefficient	0.1~2.0	1.0		
P2.17	Motor minimum weak magnetic limit	10.0~80.0	20.0		
P2.18	Weak magnetic proportion	0~65535	0		
P2.19	Motor output maximum voltage	P2.04~550V	380V		
P2.20	Motor temperature compensation	0~1	0		
P2.21	Initial temperature of motor temperature compensation	0.0~60.0℃	40.0℃		
P2.22	Motor temperature compensation coefficient	0.0~200.0	100.0		
P2.23	Reserved	0~65535			
P3 Group: Vector Control					

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P3.00	ASR proportional gain K_p1	0~100	20	○	ASR Kp1
P3.01	ASR integral time K_i1	0.01~10.00s	0.50s	○	ASR Ki1
P3.02	Low speed filter time	0.000~1.000s	0.000s	○	
P3.03	ASR switching point 1	0.00Hz~P3.07	5.00Hz	○	
P3.04	ASR proportional gain K_p2	0~100	25	○	ASR Kp2
P3.05	ASR integral time K_i2	0.01~10.00s	1.00s	○	ASR Ki2
P3.06	High speed filter time	0.000~1.000s	0.000s	○	
P3.07	ASR switching point 2	P3.02~P0.07	10.00Hz	○	
P3.08	ACR proportional gain P	0~65535	500	○	
P3.09	ACR integral gain I	0~65535	500	○	
P3.10	Driver side slip compensation coefficients	50~200%	100%	◎	
P3.11	Braking side slip compensation coefficients	50~200%	100%	◎	

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P3.12	Torque setting source	0: Disabled 1: Keypad 2: AI1 3: AI2 4: 485 communication 5:Profibus communication 6: HDI 7:CAN 8: Reserved	0	○	TORQUE SETTING
P3.13	Keypad torque setting	-100.0%~100.0%	50.0%	○	KEYPAD TORQUE SET
P3.14	Torque limit	0.0~200.0%(rated current of inverter)	150.0%	○	TORQUE LIMIT
P3.15	Torque upper limit method selection	0: Keypad(maximum torque is set up by P3.14) 1: Profibus 2: AI1 3: AI2 4: HDI1 5: CAN 6: 485 communication	0		
P3.16	Torque control prohibition access selection	0: Torque control prohibition is invalid 1: Terminal torque control prohibition is valid 2: Profibus torque control prohibition is valid 3: CAN torque control prohibition is valid 4: Three controls are valid	0		

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P3.17	Forward torque upper frequency limit	0.00~P0.07	50.00Hz		
P3.18	Forward torque upper frequency limit	0: Keyboard 1: AI1 2: AI2 3: HDI 4: 485 Communications 5: Profibus communication 6: CAN communication	0		
P3.19	Reverse torque upper frequency limit	0.00~P0.07	50.00HZ		
P3.20	Reverse torque upper frequency setting	0: Keypad 1: AI1 2: AI2 3: HDI 4: 485 communication 5: Profibus-DP	0		
P3.21	Proportional coefficient of high frequency current loop	0~65535	1000		
P3.22	Integral coefficient of high frequency current loop	0~65535	1000		
P3.23	Encoder type	0: Incremental encoder 1: SIN/COS encoder 2: UVW encoder	0		
P3.24	Encoder pulse	1~65535	1000		
P3.25	Encoder direction	0~1	0		

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P3.26	Low-speed, encoder disconnection detection time	0.0~100.0s	1.0s		
P3.27	High-speed, encoder disconnection detection time	0.0~100.0s	1.0s		
P3.28	Encoder reverse detection time	0.0~100.0s	1.0s		
P4 Group: V/F Control					
P4.00	V/F curve selection	0:Linear curve 1: User-defined curve 2: Torque_stepdown curve (1.3 order) 3: Torque_stepdown curve (1.7 order) 4: Torque_stepdown curve (2.0 order) 5: V/F separation	0	◎	V/F CURVE
P4.01	Torque boost	0.0%: auto 0.1%~10.0%	1.0%	○	TORQUE BOOST
P4.02	Torque boost cut-off	0.0%~50.0% (motor rated frequency)	20.0%	◎	BOOST CUT-OFF
P4.03	V/F frequency 1	0.00Hz~ P4.05	5.00Hz	◎	V/F FREQ 1
P4.04	V/F voltage 1	0.0%~100.0%	10.0%	◎	V/F VOLTAGE 1
P4.05	V/F frequency 2	P4.03~ P4.07	30.00Hz	◎	V/F FREQ 2
P4.06	V/F voltage 2	0.0%~100.0%	60.0%	◎	V/F VOLTAGE 2
P4.07	V/F frequency 3	P4.05~ P2.01	50.00Hz	◎	V/F FREQ 3

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P4.08	V/F voltage 3	0.0%~100.0%	100.0%	◎	V/F VOLTAGE 3
P4.09	V/F slip compensation	0.00~10.00Hz	0.0Hz	○	V/F SLIP COMP
P4.10	AVR function	0: Disabled 1: Enabled all the time 2: Disabled during deceleration	1	○	AVR
P4.11	Auto energy saving selection	0: Disabled 1: Enabled	0	○	ENERGY SAVING
P4.12	Terminal detection when power on	0: Command invalid 1: Command valid	0	○	FWD/REV ENABLE
P4.13	Output voltage reference	0:P4.14 1:AI1 2:AI2 3:Modbus communication (0x2006)	0		
P4.14	Output voltage keypad reference	0.0~100.0%	100.0%		
P4.15	Mini output voltage	0.0~100.0%	0%		
P5 Group: Input Terminals					
P5.00	HDI selection	0: HDI1 as high speed pulse input 1: HDI1 is ON-OFF input	0	◎	HDI SELECTION
P5.01	Communication Input selection	0: Concrete 1: Virtual	0	◎	INPUT SELECTION
P5.02	S1 Terminal function	0:Invalid 1:Forward 2:Reverse	1	◎	S1 FUNCTION

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P5.03	S2 Terminal function	3:3-wire control 4:Jog forward 5:Jog reverse 6:Coast to stop 7:Reset fault 8:Pause running 9:External fault input 10:UP command 11:DOWN command 12:Clear UP/DOWN 13:Switch between A and B 14:Switch between A and A+B 15:Switch between B and A+B 16: Multi-step speed reference1 17: Multi-step speed reference2 18: Multi-step speed	4	◎	S2 FUNCTION
P5.04	S3 Terminal function		7	◎	S3 FUNCTION
P5.05	S4 Terminal function		0	◎	S4 FUNCTION
P5.06	S5 Terminal function		0	◎	S5 FUNCTION
P5.07	HDI1 terminal function		0	◎	HDI1 FUNCTION
P5.08	S7 Terminal function		0	◎	HDI2 FUNCTION
P5.09	S8 Terminal function		0	◎	S6 FUNCTION
P5.10	S9 Terminal function		0	◎	S7 FUNCTION

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P5.11	S10 Terminal function	reference3 19: Multi-step speed reference4 20: Multi-step speed pause 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Reset simple PLC when stop 24: Pause simple PLC 25: Pause PID 26: Pause traverse operation 27: Reset traverse operation 28: Reset counter 29: Reset length 30: ACC/DEC ramp hold 31: Disable torque control 32~52: Water supply control 53: 3-wire jog control 54~55: reversed	0	◎	S8 FUNCTION
P5.12	ON-OFF filter times	1~10	5	○	Sx FILTER TIMES
P5.13	Terminal control mode	0: 2-wire control mode 1 1: 2-wire control mode 2 2: 3-wire control mode 1 3: 3-wire control mode 2	0	◎	FWD/REV CONTROL
P5.14	UP/DOWN setting change rate	0.01~50.00Hz/s	0.50Hz/s	○	UP/DOWN RATE

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P5.15	AI1 lower limit	0.00V~10.00V	0.00V	○	AI1 LOW LIMIT
P5.16	AI1 lower limit corresponding setting	-100.0%~100.0%	0.0%	○	AI1 LOW SETTING
P5.17	AI1 upper limit	0.00V~10.00V	10.00V	○	AI1 UP LIMIT
P5.18	AI1 upper limit corresponding setting	-100.0%~100.0%	100.0%	○	AI1 UP SETTING
P5.19	AI1 filter time constant	0.00s~10.00s	0.10s	○	AI1 FILTER TIME
P5.20	AI2 lower limit	0.00V~10.00V	0.00V	○	AI2 LOW LIMIT
P5.21	AI2 lower limit corresponding setting	-100.0%~100.0%	0.0%	○	AI2 LOW SETTING
P5.22	AI2 upper limit	0.00V~10.00V	5.00V	○	AI2 UP LIMIT
P5.23	AI2 upper limit corresponding setting	-100.0%~100.0%	100.0%	○	AI2 UP SETTING
P5.24	AI2 filter time constant	0.00s~10.00s	0.10s	○	AI2 FILTER TIME
P5.25	HDI1 selection	0: Setting input 1: Counting input 2: Length input 3~4: Reserved	0	○	
P5.26	HDI1 lower limit frequency	0Hz~50.0kHz	0.0kHz	○	
P5.27	HDI1 lower limit frequency corresponding setting	-100.0~100.0	0.0%	○	

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P5.28	HDI1 upper limit frequency	0Hz~50.0kHz	0.0kHz	○	
P5.29	HDI1 upper limit frequency corresponding setting	-100.0~100.0	100.0%	○	
P5.30	HDI1 frequency filter time constant	0.00s~10.00s	0.10s	○	
P5.31	Terminal input	0~0x3FF	0	○	
P6 Group: Output Terminals					
P6.00	HDO selection	0: High-speed pulse output 1: ON-OFF output	0	◎	HDO SELECTION
P6.01	Y1 output selection	0: NO output 1: Run forward 2: Run reverse 3: Fault output 4: Motor overload 5: Inverter overload 6: FDT reached 7: Frequency reached 8: Zero speed running 9: Preset count value	1	○	Y1 SELECTION
P6.02	Y2 output selection		0	○	Y2 SELECTION
P6.03	HDO ON-OFF output selection		0	○	HDO SELECTION
P6.04	Relay 1 output selection		3	○	RO1 SELECTION
P6.05	Relay 2 output selection		0	○	RO2 SELECTION

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P6.06	Relay 3 output selection	reached 10: Specified count value reached 11: Length reached 12: PLC cycle completed 13: Running time reached 14: Upper frequency limit reached 15: Lower frequency limit reached 16: Ready 17: Auxiliary motor1 started 18: Auxiliary motor2 started 19: Motor running 20: Stop pulse output 21~31: Reserved	0	○	RO3 SELECTION
P6.07	AO1 function selection	0: Running frequency 1: Reference frequency 2: Motor speed 3: Output current 4: Output voltage 5: Output power 6: Output torque 7: AI1 voltage 8: AI2 voltage/current 9: AI3 voltage 10: AI4 voltage 11: HDI1 frequency 12: HDI2 frequency 13: Length value 14: Count value	0	○	AO1 SELECTION
P6.08	AO2 function selection		0	○	AO2 SELECTION
P6.09	HDO function selection		0	○	HDO SELECTION

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P6.10	AO1 lower limit	0.0%~100.0%	0.0%	○	AO1 LOW LIMIT
P6.11	AO1 lower limit corresponding output	0.00V ~10.00V	0.00V	○	AO1 LOW OUTPUT
P6.12	AO1 upper limit	0.0%~100.0%	100.0%	○	AO1 UP LIMIT
P6.13	AO1 upper limit corresponding output	0.00V ~10.00V	10.00V	○	AO1 UP OUTPUT
P6.14	AO2 lower limit	0.0%~100.0%	0.0%	○	AO2 LOW LIMIT
P6.15	AO2 lower limit corresponding output	0.00V ~10.00V	0.00V	○	AO2 LOW OUTPUT
P6.16	AO2 upper limit	0.0%~100.0%	100.0%	○	AO1 UP LIMIT
P6.17	AO2 upper limit corresponding output	0.00V ~10.00V	10.00V	○	AO2 UP OUTPUT
P6.18	AO3 lower limit	0.0%~100.0%	0.0%	○	
P6.19	HDO lower limit corresponding output	0.0 ~ 50.0kHz	0.0kHz	○	
P6.20	AO3 upper limit	0.0%~100.0%	100.0%	○	
P6.21	HDO upper limit corresponding output	0.0 ~ 50.0kHz	50.0kHz	○	
P7 Group: Display Interface					
P7.00	User password	0~65535	0	○	USER PASSWORD

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P7.01	LCD language selection	0: Chinese 1: English	0	○	LANGUAGE SELECT
P7.02	Parameter copy	0: Invalid 1: Upload parameters to LCD 2: Download parameters from LCD	0	◎	PARA COPY
P7.03	QUICK/JOG function selection	0: Quick debugging mode 1: FDW/REV switching 2: Jog 3: Clear UP/DOWN setting	0	◎	QUICK/JOG FUNC
P7.04	STOP/RST function selection	0: Valid when keypad control (P0.01=0) 1: Valid when keypad or terminal control (P0.01=0 or 1) 2: Valid when keypad or communication control (P0.01=0 or 2) 3: Always valid	0	○	STOP/RST FUNC
P7.05	Motor temperature				
P7.06	Running state display selection	0~0xFFFF	0x00FF	○	
P7.07	Stop status display selection	0x0001~0xFFFF	0x00FF	○	

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P7.08	Rectifier module temperature	0~150.0℃	0~150.0	●	
P7.09	IGBT module temperature	0~150.0℃	0~150.0	●	
P7.10	MCU software version			●	
P7.11	DSP software version			●	
P7.12	Accumulated running time	0~65535h	0~65535	●	
P7.13	Previous two fault type	0~50	0	●	
P7.14	Previous fault type		0	●	
P7.15	Current fault type		0	●	
P7.16	Output frequency at current fault		0	●	
P7.17	Output current at current fault			●	
P7.18	DC bus voltage at current fault			●	
P7.19	Input terminal status at current fault			●	
P7.20	Output terminal status at current fault			●	
P7.21	Inverter rated power				
P7.22	Inverter rated current				
P8 Group: Enhanced Function					

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P8.00	Acceleration time 1	0.0~3600.0s	20.0s	○	ACC TIME 1
P8.01	Deceleration time 1	0.0~3600.0s	20.0s	○	DEC TIME 1
P8.02	Acceleration time 2	0.0~3600.0s	20.0s	○	ACC TIME 2
P8.03	Deceleration time 2	0.0~3600.0s	20.0s	○	DEC TIME 2
P8.04	Acceleration time 3	0.0~3600.0s	20.0s	○	ACC TIME 3
P8.05	Deceleration time 3	0.0~3600.0s	20.0s	○	DEC TIME 3
P8.06	Jog reference	0.00~P0.07	5.00Hz	○	JOG REF
P8.07	Jog Acceleration time	0.0~3600.0s	20.0s	○	JOG ACC TIME
P8.08	Jog Deceleration time	0.0~3600.0s	20.0s	○	JOG DEC TIME
P8.09	Skip frequency 1	0.00~P0.07	0.00Hz	○	SKIP FREQ 1
P8.10	Skip frequency 2	0.00~P0.07	0.00Hz	○	SKIP FREQ 2
P8.11	Skip frequency bandwidth	0.00~P0.07	0.00Hz	○	SKIP FREQ RANGE
P8.12	Traverse amplitude	0.0~100.0% (with reference to P0.10)	0.0%	○	TRAV AMPLITUDE
P8.13	Jitter frequency	0.0~50.0%	0.0%	○	JITTER FREQ
P8.14	Rise time of traverse	0.1~3600.0s	5.0s	○	TRAV RISE TIME
P8.15	Fall time of traverse	0.1~3600.0s	5.0s	○	TRAV FALL TIME

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P8.16	Auto reset times	0~3	0	○	AUTO RESET TIMES
P8.17	Fault relay action	0: Disabled 1: Enabled	0	○	FAULT ACTION
P8.18	Reset interval	0.1~100.0s	1.0s	○	RESET INTERVAL
P8.19	Preset length	1~65535	1000	○	PRESET LENGTH
P8.20	Actual length	0~65535	0	○	ACTUAL LENGTH
P8.21	Number of pulse per cycle	0.1~6553.5	100.0	○	PULSE NUMBER
P8.22	Preset count value	1~65535	1000	○	PRESET COUNT
P8.23	Specified count value	1~65535	1000	○	SPECIFIED COUNT
P8.24	Preset running time	0~65535h	65535 h	○	RUNNING TIME
P8.25	FDT level	0.00~ P0.07	50.00Hz	○	FDT LEVEL
P8.26	FDT lag	0.0~100.0%	5.0%	○	FDT LAG
P8.27	Frequency arrive detecting range	0.0~100.0% (maximum frequency)	0.0%	○	FAR RANGE
P8.28	Droop control	0.00~10.00Hz	0.00Hz	○	DROOP CONTROL
P8.29	Auxiliary motor selection	0: Invalid 1: Motor 1 valid 2: Motor 2 valid 3: Both valid	0	◎	AUXILIARY MOTOR
P8.30	Auxiliary motor1 START/STOP delay time	0.0~3600.0s	5.0s	○	MOTOR 1 DELAY

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P8.31	Auxiliary motor2 START/STOP delay time	0.0~3600.0s	5.0s	○	MOTOR 2 DELAY
P8.32	Brake threshold voltage	320.0~750.0V	700.0V	○	BRAK VOLT
P8.33	Low-frequency threshold of restraining oscillation	0~9999	1000	○	LO FREQ RESTRAIN
P8.34	High-frequency threshold of restraining oscillation	0~9999	1000	○	HI FREQ RESTRAIN
P9 Group: PID Control					
P9.00	PID preset source selection	0: Keypad 1: AI1 2: AI2 3: HDI1 4: Simple PLC 5:485 communication 6:Profibus communication 7: CAN communication	0	○	PID PRESET
P9.01	Keypad PID preset	0.0%~100.0%	0.0%	○	KEYPAD PID SET
P9.02	PID feedback source selection	0: AI1 1: AI2 2: AI1-AI2 3: HDI1 4: 485 communication 5:Profibus communication 6: CAN communication	0	○	PID FEEDBACK

Function Code	Name	Description	Factory Setting	Modify	LCD Display
P9.03	PID output characteristics	0: Positive 1: Negative	0	○	PID OUTPUT
P9.04	Proportional gain (Kp)	0.00~100.00	0.10	○	PROPORTION GAIN
P9.05	Integral time (Ti)	0.01~10.00s	0.10s	○	INTEGRAL TIME
P9.06	Differential time (Td)	0.00~10.00s	0.00s	○	DIFFERENTIA TIME
P9.07	Sampling cycle (T)	0.01~100.00s	0.50s	○	SAMPLING CYCLE
P9.08	Bias limit	0.0~100.0%	0.0%	○	BIAS LIMIT
P9.09	PID output filter time	0.00~10.00s	0.00	○	OUTPUT FILTER
P9.10	Feedback lost detecting value	0.0~100.0%	0.0%	○	FEEDBACK LOST
P9.11	Feedback lost detecting time	0.0~3600.0s	1.0s	○	FEEDBACK LOST(t)
PA Group: Multi-step Speed Control					
PA.00	Simple PLC mode	0: Stop after one cycle 1: Hold last frequency after one cycle 2: Circular run	0	○	PLC MODE
PA.01	Simple PLC state saving selection	0: Not saved 1: Saved 2: Not saved when power off, saved when stop	0	○	STATE SAVING
PA.02	Multi-step speed 0	-100.0~100.0%	0.0%	○	MULTI-SPEED 0
PA.03	0^{th} Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 0
PA.04	Multi-step speed 1	-100.0~100.0%	0.0%	○	MULTI-SPEED 1

Function Code	Name	Description	Factory Setting	Modify	LCD Display
PA.05	1st Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 1
PA.06	Multi-step speed 2	-100.0~100.0%	0.0%	○	MULTI-SPEED 2
PA.07	2nd Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 2
PA.08	Multi-step speed 3	-100.0~100.0%	0.0%	○	MULTI-SPEED 3
PA.09	3rd Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 3
PA.10	Multi-step speed 4	-100.0~100.0%	0.0%	○	MULTI-SPEED 4
PA.11	4th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 4
PA.12	Multi-step speed 5	-100.0~100.0%	0.0%	○	MULTI-SPEED 5
PA.13	5th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 5
PA.14	Multi-step speed 6	-100.0~100.0%	0.0%	○	MULTI-SPEED 6
PA.15	6th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 6
PA.16	Multi-step speed 7	-100.0~100.0%	0.0%	○	MULTI-SPEED 7
PA.17	7th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 7
PA.18	Multi-step speed 8	-100.0~100.0%	0.0%	○	MULTI-SPEED 8
PA.19	8th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 8
PA.20	Multi-step speed 9	-100.0~100.0%	0.0%	○	MULTI-SPEED 9

Function Code	Name	Description	Factory Setting	Modify	LCD Display
PA.21	9th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 9
PA.22	Multi-step speed 10	-100.0~100.0%	0.0%	○	MULTI-SPEED 10
PA.23	10th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 10
PA.24	Multi-step speed 11	-100.0~100.0%	0.0%	○	MULTI-SPEED 11
PA.25	11th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 11
PA.26	Multi-step speed 12	-100.0~100.0%	0.0%	○	MULTI-SPEED 12
PA.27	12th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 12
PA.28	Multi-step speed 13	-100.0~100.0%	0.0%	○	MULTI-SPEED 13
PA.29	13th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 13
PA.30	Multi-step speed 14	-100.0~100.0%	0.0%	○	MULTI-SPEED 14
PA.31	14th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 14
PA.32	Multi-step speed 15	-100.0~100.0%	0.0%	○	MULTI-SPEED 15
PA.33	15th Step running time	0.0~6553.5s(h)	0.0s	○	RUNNING TIME 15
PA.34	ACC/DEC time selection for step 0~7	0~65535	0	○	0~7 TIME SELECT
PA.35	ACC/DEC time selection for step 8~15	0~65535	0	○	8~15 TIME SELECT

Function Code	Name	Description	Factory Setting	Modify	LCD Display
PA.36	Time unit	0: Second 1: Hour	0	◎	TIME UNIT
Pb Group: Protection Function					
Pb.00	Input phase-failure protection	0: Disabled 1: Enabled	1	○	IN PHASE FAIL
Pb.01	Output phase-failure protection	0: Disabled 1: Enabled	1	○	OUT PHASE FAIL
Pb.02	Motor overload protection	0: Disabled 1: Normal motor 2: Variable frequency motor	2	◎	MOTOR OVERLOAD
Pb.03	Motor overload protection current	20.0%~120.0%	100.0%	○	OVERLOAD CURR
Pb.04	Overload pre-warning threshold	20.0%~150.0%	130.0%	○	OL WARN CURR
Pb.05	Overload pre-warning selection	0: Always detect relative to motor rated current 1: Detect while constant speed relative to motor rated current 2: Always detect relative to inverter rated current 3: Detect while constant speed relative to inverter rated current	0	◎	OL WARN SELECT
Pb.06	Overload pre-warning delay time	0.0~30.0s	5.0s	○	OL WARN DELAY
Pb.07	Threshold of trip-free	230.0V~600.0V	450.0V	○	TRIPFREE POINT

Function Code	Name	Description	Factory Setting	Modify	LCD Display
Pb.08	Decrease rate of trip-free	0.00Hz~P0.07	0.00Hz	○	TRIPFREE DECRATE
Pb.09	Over-voltage stall protection	0: Disabled 1: Enabled	0	○	OVER VOLT STALL
Pb.10	Over-voltage stall protection point	110~150%	125%	○	OV PROTECT POINT
Pb.11	Over-current protection	0: Disabled 1: Enabled	1	○	OVER CURR
Pb.12	Over-current stall threshold	50~200%	160%	○	OC THRESHOLD
Pb.13	Frequency decrease rate	0.00~50.00Hz/s	1.00 Hz/s	○	FREQ DEC RATE
Pb.14	Speed deviation protection	0.1~50.0%	20.0%		
Pb.15	Speed deviation time	0.000~10.000	0.500s		
Pb.16	Motor overtemperature protection	0:Disabled 1:Enabled	0		
Pb.17	Temperature adjustment bias	-80.0~80.0	0.0℃		
Pb.18	Temperature correction factor	50.0~150.0	100.0%		
Pb.19	Motor overtemperature protection point	0~150.0℃	120.0℃		
PC Group: Serial Communication					
PC.00	Local communication address	1~247 0: broadcast address	1	○	LOCAL ADDRESS

Function Code	Name	Description	Factory Setting	Modify	LCD Display
PC.01	Communication baudrate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	4	○	BAUD RATE
PC.02	Data bit checkout setting	0: No checkout (8, N, 2) for RTU 1: Even checkout (8, E, 1) for RTU 2: Odd checkout (8, O, 1) for RTU 3: No checkout (8, N, 2) for ASCII 4: Even checkout (8, E, 1) for ASCII 5: Odd checkout (8, O, 1) for ASCII 6: No checkout (7, N, 2) for ASCII 7: Even checkout (7, E, 1) for ASCII 8: Odd checkout (7, O, 1) for ASCII	0	○	DATA FORMAT
PC.03	Communication answer delay	0~200ms	5	○	COM DELAY TIME
PC.04	Fault time of communication overtime	0.0（invalid） 0.1~100.0s	0.0s	○	COM TIMEOUT

Function Code	Name	Description	Factory Setting	Modify	LCD Display
PC.05	Transmission fault processing	0: Communication answer enabling 1: Communication answer closing	0	○	RESPONSE ACTION
PC.06	Transmission response processing	0: Alarm and coast to stop 1: Do not alarm and keep running 2: Do not alarm and stop at the stopinh method (only for communication control mode) 3: Do not alarm and stop at the stopinh method (only for all control modes)	0~3	0	FAULT ACTION
PC.08	Ethernet communication speed setting	0: 10 M full-duplex 1: 10 M half-duplex 2: 100 M full-duplex 3: 100 M half-duplex 4: Adaptive	0		
PC.09	IP Address 1	0~255	192		
PC.10	IP Address 2	0~255	168		
PC.11	IP Address 3	0~255	0		
PC.12	IP Address 4	0~255	1		
PC.13	Subnet Mask 1	0~255	255		
PC.14	Subnet Mask 2	0~255	255		
PC.15	Subnet Mask 3	0~255	255		
PC.16	Subnet Mask 4	0~255	0		
PC.22	CAN Address	0~127	1		

Function Code	Name	Description	Factory Setting	Modify	LCD Display
PC.23	CAN baud rate settings	0：100K BPS 1：125K BPS 2：250K BPS 3：500K BPS 4：1M BPS	3		
PC.24	CAN communication timeout delay	0.0~100.0s	0s		
Pd Group: Profibus communication					
Pd.00	Module type	1:Profibus	Profibus		
Pd.01	Module address	0~99	2		
Pd.02	PZD2 receiving	0: Invalid 1: Speed reference 2: Traction reference 3: Upper limit current reference 4: The starting pre-torque compensation value 5: Torque upper limit frequency 6: Master-slave mode selection 7：Motor temperature given 8~20: Reserved	1		
Pd.03	PZD3 receiving		2		
Pd.04	PZD4 receiving		3		
Pd.05	PZD5 receiving		0		
Pd.06	PZD6 receiving		0		
Pd.07	PZD7 receiving		0		
Pd.08	PZD8 receiving		0		
Pd.09	PZD9 receiving		0		
Pd.10	PZD10 receiving		0		
Pd.11	PZD11 receiving		0		
Pd.12	PZD12 receiving		0		
Pd.13	PZD2 sending	0: Invalid 1: Running frequency 2: Reference speed rpm 3: DC bus voltage 4: Output voltage 5: Output current 6: Output torque	9		
Pd.14	PZD3 sending		10		
Pd.15	PZD4 sending		11		
Pd.16	PZD5 sending		6		
Pd.17	PZD6 sending		7		
Pd.18	PZD7 sending		5		
Pd.19	PZD8 sending		0		

Function Code	Name	Description	Factory Setting	Modify	LCD Display
Pd.20	PZD9 sending	pecentage	0		
Pd.21	PZD10 sending	7: Output power	0		
Pd.22	PZD11 sending	pecentage	0		
Pd.23	PZD12 sending	8: Frequncy reference 9: Function code 10: Reserved 11: PG card position 12: Input terminal status 13: Output terminal status 14: Torque compensation 15: Motor rated torque 16: Reference frequency of the slope 17:Pd.24 18~30: Reserved	0		
Pd.24	Temporary variable of PZD sending	0~65535	0		
Pd.25	Time of Dp communication overtime fault	0.0~100s	0.0s		
PE Group: Factory Setting					
PE.00	Factory Password	0~65535	*****	●	FACTORY PASSWORD

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